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SEARCHING

Research: A Path to Development

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Research: A Path to Development

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Introduction

The year 1985 will surely always be recalled with horror as the year of disaster. The frequency and ferocity of so many natural events is likely without historic precedent. Tidal wave, drought, earthquake, flood, volcanic eruption, hurricane; all were present. The human species found itself challenged again and again by a seemingly endless array of furies of natural origin.

Yet if these events were natural in their beginnings, such was certainly not the case in their impact. In many of the incidents, death and destruction was increased by the intermediary of human acts, sometimes of omission, sometimes of commission. Whether it was failure to heed warnings, unwillingness to respect the cyclical pattern of certain events, or inability to diminish the impact of natural forces, the human factor was all too often a major influence in the multiplication of misery.

The grisly count of death and carnage spared no continent in 1985. Yet it was in the developing regions that the numbers soared: Bangladesh — tidal wave, 10000 dead; Mexico — earthquake, 7000 dead; Ethiopia — drought, hundreds of thousands of deaths; Colombia — volcanic eruption, 25000 dead. The drought, floods, and blizzards that struck North America, Europe, and Australia in 1985 brought tragedy in their wake but in nowhere near the same numbers.

The reasons are clear. A country such as Canada is able to limit the effect of major storms through a sophisticated network of activities that permits effective early warning and mandatory evacuations of threatened areas. The design and construction of houses and buildings, of highways and bridges, assures escape from all but the most unlikely of natural events. The infrastructure of hospitals, relief agencies, food outlets, emergency transportation, and communication grids is able quickly to be harnessed for emergency purposes to limit quickly the impact of disaster. None of this is available in many developing countries. As a result, an event that is merely a nuisance in the North becomes cataclysmic in the South.

That much is indeed obvious and carries with it troubling moral questions. There are still more questions though, as puzzling in their nature as the disparities in death figures are disturbing. Why is the frequency of natural disasters apparently increasing?

The plastic handpump is demonstrated for IDRC President Ivan L. Head in Malaysia.

Why is the magnitude of their impact increasing? Why are developing countries most often the locus of the most serious of these events? What are the most effective remedial measures?

It is only recently that these and a host of similar questions have been posed. The data bases are as yet thin and often unreliable. They reflect in large measure the still inadequate research capacity of so many developing countries. The same inadequacy that hinders the governments of these countries in their efforts to increase food production, decrease infant mortality, extend literacy, and solve problems of myriad sorts. And so people continue to die needlessly. And in immense numbers.

It was that inadequacy that prompted the creation of IDRC 15 years ago, and that motivates its continued activity.

The solution of problems, and the enhancement of local competence — these remain the primary goals of the Centre. Whether it be the design of an improved village water pump, or the strengthening of regional and national research institutions, IDRC endeavours to respond professionally and effectively to genuine need.

The Centre, of course, is only one of many participants in a development process that has proved to be more complicated — with results more elusive — than was envisaged even 15 years ago. Attempts to improve living conditions in developing countries have been very effective in some instances, but not in all, and have sometimes given rise to effects not originally anticipated. This is equally true in the particular processes employed by IDRC in building research capacity and supporting research that contributes to the solution of development problems. Developing-country governments and donor agencies are looking constantly for better approaches, for more effective results.

Searching describes IDRC's efforts in these respects as it endeavours continually to respond imaginatively and effectively to demonstrated need.

In the pages that follow will be found discussions of that need.

Ivan L. Head
President, IDRC

International and Regional Research Institutions

The period since World War II has seen an unparalleled commitment to international cooperation. Initial enthusiasm for the development of multilateral institutions owed much to the experience of a World War and to the depression and international economic hardship that had preceded it. The growing number of countries attaining independence in the 1950s and 1960s, bringing with them aspirations for improvements in the living conditions of their peoples, encouraged the evolution of the existing system. Third World countries have been especially vocal in supporting the evolution of multilateral mechanisms as a critical element in assisting them to meet their national development objectives.

With 1985 marking the 40th anniversary of the United Nations (U.N.), the agencies of the U.N. system are particularly in focus. The World Bank and the International Monetary Fund (IMF) have taken on an increasingly prominent role with the continuing economic and financial crisis facing Third World countries. The General Agreement on Tariffs and Trade (GATT) continues to be the major forum in which discussions of trade expansion take place. The agencies of the U.N. system are, however, only the best known and most universal of a vast array of institutions and groupings that have been created by groups of countries coalescing around perceived common interests — trade groupings, political groupings — the ambition of many encompassing both these areas and more.

Growth of Multilateral Institutions

Although the development of new universal organizations has been halted since the International Fund for Agricultural Development (IFAD) was established in 1979, regional organizations are still being formed, expanded, or revitalized. In Africa, the Southern Africa Development Coordination Committee (SADCC) is perhaps the best recent example of a multilateral approach to a common set of problems. The Preferential Trade Area formed by 14 East, Central, and Southern African countries in July 1984 and the Economic Community of West African States (ECOWAS), formed in 1975, are other examples. Both the Organization of American States (OAS) and the Organization of African Unity (OAU) have provided opportunities for discussion of regional issues. The OAU summit meeting held in July 1985, while focusing on the poor economic performance of African countries, reaffirmed the importance of regional groupings to future prosperity, also a salient feature of the Lagos Plan. Four main regional development banks were established between 1959 and 1969 to organize and provide financing for major development projects in their region. In Asia, efforts at collaboration have been stepped up both within and outside organizations such as the Association of South East Asian Nations (ASEAN). This commitment to regional groupings has not detracted from organizations where membership is determined on different criteria such as the Commonwealth, which continues to grow as new countries become eligible for membership.

This impressive set of postwar multilateral institutions, regional and international, contributed to providing an environment in which some major achievements have been realized. This period has seen the largest burst of

sustained economic growth in human history and great efforts to alleviate poverty and pressing development needs. Gross national product (GNP) per capita increased on average by 3.1% per year in the developing countries between 1955 and 1980, whereas in the industrial market economies it grew by 3.6% from 1955 to 1970 and by 2.4% in 1970–80.

Important progress was made in developing countries with respect to social indicators such as literacy and child mortality. Clearly, however, all did not share in the fruits of economic growth. Although the 1960s allowed for a certain optimism and the hope that many developing countries would emulate the development of the industrialized countries, there was a growing sense of frustration in the 1970s engendered by the vast gap between the expectation of sharing in world prosperity and the reality of limited success. The call for a New International Economic Order — and discussion of issues in the global context of North–South relations — provided demands for change that were not easily or readily accommodated.

In the 1970s and 1980s, multilateralism has been under pressure for both economic and political reasons. There have been movements toward greater trade protectionism, although these have been challenged by proposals to liberalize trade further. This tougher international climate has directly affected most multilateral institutions because they depend in large part on funding from developed countries via Official Development Assistance (ODA) budgets. In its latest annual review of members' ODA (*Development Cooperation, 1984*), the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) considers three views of the future: first, that recent problems in funding multilateral agencies will be followed by a resumption along the same lines as before; second, that these problems "herald a reversion to the primitive situation of the early 1960s, when what was called 'aid' was no more than a conglomeration of widely differing activities, with widely differing objectives." The review concludes: "So one is led to a *third* and brighter view, according to which the recent problems of funding have been sufficiently severe to force a review of the role of multilateral agencies, both individually and collectively without threatening their destruction (one or two agencies, notably IFAD, excepted)."

Whatever the specific value or need for change in particular institutions, there continue to be strong arguments for the maintenance and strengthening of a multilateral framework in which work can be undertaken on the growing number of issues that transcend national boundaries. Nowhere is this more true than in the field of research.

Multilateral R&D Institutions

The multilateral approach has a particular attraction in the fields of science and research. The arguments in favour of international cooperation are here every bit as cogent as in other fields of economic and technical endeavour. Many of the problems being tackled by research are common to several countries and influence the lives of large numbers of people. No country, not even the largest and most advanced, can afford to ignore scientific discoveries and progress being made elsewhere. The scientific community and increasingly the public have become aware of the interdependence between nations and the role that science can be made to play in solving development problems. At the same time, there has been an increasing sense of the growing vulnerability of the whole planet to changes or threats to one part of the global system.

As might be expected, some major developments concerning multilateral

institutions and contacts have been those related to research. The International Development Research Centre (IDRC) has been a part of these developments and has played a role not only in supporting the activities of a number of the institutions concerned, but also in the establishment of several. With this involvement, there has been a growing realization that the full dimensions of the set of institutions concerned do not appear to have been widely recognized or documented. As a result, IDRC has recently been undertaking a survey to gather more information on them.

Nearly 300 institutions were initially identified that were based in developing countries and appeared to have a multilateral mandate and a direct role in undertaking or complementing research. No research-funding agencies were included. Although the survey is not yet finished, 192 institutions have now been confirmed, mostly by returns to a mail survey, as fitting the general criteria of the study.

The survey covered a heterogeneous array of research-related institutions. "Multilateral" was taken in most instances as meaning that an institution covers *at least three countries*, both in the sense of it owing its existence to the initiative of several countries or multilateral agencies and in having an objective of providing services to more than one country. These institutions are usually termed regional or international. "Multilateral" has been used here to cover both categories. Of the 192 institutions that have returned questionnaires, probably 30 could reasonably claim to have an "international" focus in terms of covering a number of geographical regions, whereas the remaining 162 were regional. This was not, however, a hard and fast line.

The IDRC survey includes both institutions that are directly involved in *conducting research* as their major purpose (the Asian Vegetable Research and Development Centre and the Caribbean Industrial Research Institute, for example), and those that are *research complementing* by providing support services to research such as research promotion, training, information, and dissemination (for example, the Council for the Development of Economic and Social Research in Africa and the Arab Organization for Agricultural Development). Although a distinction has been made between these two groups in terms of their involvement in research, the institutions more properly belong on a spectrum. It is easy to distinguish between institutions at opposite ends of the spectrum in terms of their

How many jobs are created by rural agroindustries like peanut processing? Planners are working to find out.

role in research, but the dividing line between the two categories is not a hard and fast one. At present, 82 of the 192 institutions are classified as "conducting research" and 110 as "research complementing."

The information collected to date is believed to be reasonably comprehensive and representative of the total. IDRC will publish a directory of institutions once the survey is completed. It covers only those institutions that are based in developing countries; those based in developed countries, such as the International Food Policy Research Institute (IFPRI), represent a significant additional number of institutions.

The total resources required annually for the activities of all institutions covered in the survey may be as high as $1 billion. Those institutions involved in a major way with research account for about $500 million, of which the International Agricultural Research Centres (IARCs) make up a little under half. The research budget of institutions involved less directly in research is a further $75 million.

Research may not be a major part of the overall mandate of some of those organizations identified as "research complementing," but, nevertheless, they play an important role in research developments and coordination in their regions. All institutions were asked to estimate the research portion of their budgets, although they have clearly done this using considerably different criteria. Some of the IARCs, for instance, report as little as 40% of their total budget as *research*, where for the purposes of the IDRC survey almost their entire budget might usefully be counted as research.

The institutions covered do not form any kind of global system, implying, as this term does, a rational and integrated set of activities, and the IDRC survey may be the first time that they have been analyzed as a group separate from other international and regional institutions. Many owe their initial funding to initiatives of U.N. specialized agencies; others have been established to take care of a general or sectoral research interest under the umbrella of regional organizations having a primarily economic or political purpose. They range from the best known group — the IARCs with their common funding source through the Consultative Group on International Agricultural Research (CGIAR) to institutions that have been established in isolation from similar ones existing elsewhere. They vary also in size from a budget of less than $50000 to over $20 million.

Given this marked heterogeneity, it is important to bear in mind that many of the institutions are small and cannot easily be compared to the best known of the multilateral research institutions. In spite of the imperfections of the data, however, the overall numbers, resources, and potential impact on national research programs in developing countries make it essential to carry out some common analysis and review of this group of institutions that has been identified as playing a role in research. This is particularly so from the point of view of donor organizations such as IDRC, because these institutions require a significant proportion of their funding from donor agencies and thus represent a substantial, "permanent" draw on ODA resources.

From a base of only five in 1945, the number of multilateral research-related institutions has grown rapidly to the present figure of over 200, with a peak number being established in the 1970s, when an average of eight new institutions were created each year.

Initial information indicates that this growth has dropped off markedly in the 1980s; although part of this perceived drop may be because of a lag in a new institution becoming established and well known, it clearly relates also to the prevailing shortage of funding and the increased questioning of the role of

multilateral organizations. In some cases, such as agricultural research, it may also be because of a feeling that the most important research areas are now covered by international centres. Figure 1 groups institutions by the date of their establishment.

Although the development of multilateral, research-related institutions has been global and of significance in all regions, the rate of creation is explained not only by the availability of resources for new institutions but also by the pattern and rhythm of countries achieving independence and wishing to form regional groupings and by timing of the arrival on the world "agenda" of various issues and problems (population, environment). The growth in the 1940s and 1950s was focused in Latin America, that of the 1960s, however, came to some extent from all regions but increasingly from Africa and the Caribbean. The 1970s saw a marked increase in overall numbers, with particular concentration in sub-Saharan Africa. The number of such institutions in a region is clearly related to the number of countries in the region and to the need and desire to form subregional centres or groups. Figure 2 shows the pattern of establishment by region; the rate of new creations for 1981–85 has been used to make a projection, assuming a constant rate for the decade, for the probable number to be established in the 1980s.

A sectoral breakdown of institutions indicates a concentration in agriculture and social sciences (see the following table and Fig. 3) with considerably less focus on health and industry. If education were included with the social sciences, the number of institutions in the agricultural and social sciences fields would be approximately the same.

As can be seen from the table, the global figures hide the fact of considerable regional variation; agricultural institutions are spread fairly evenly across the regions, although South and Southeast Asia and sub-Saharan Africa account for 72% of the total. Over half the social science institutions, however,

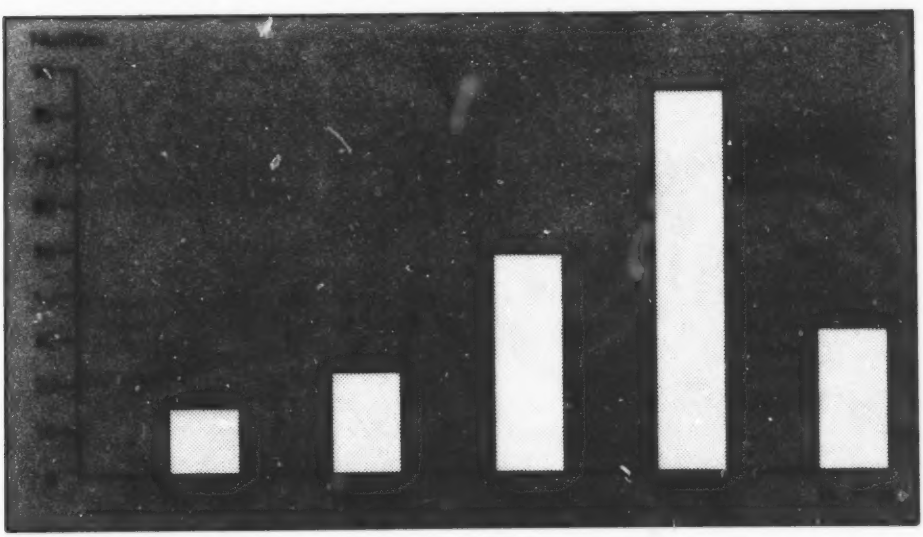


Fig. 1. Multilateral research-related institutions by year of establishment. (The projection for 1981–90 is based on 1981–85 experience.)

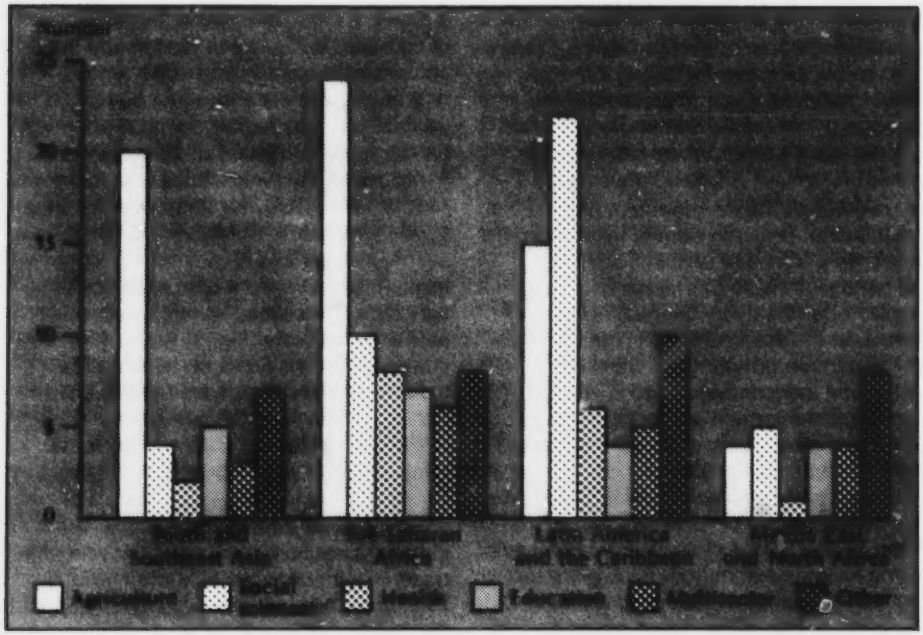


Fig. 2. Multilateral research-related institutions by sector and region.

are located in Latin America; the number appears to be related to the combination of a large pool of well-trained researchers in an environment where some governments have been neither receptive to nor supportive of social science research in national institutions. Multilateral institutions have been perceived as providing easier access to external funding and greater insulation from political pressures.

Although the data on the resources of these institutions are still the least precise area of information collected in the survey, it seems that they employ over 5000 professional staff (the term professional was used for personnel having at least a Bachelor's degree or its equivalent).

Role of Multilateral R&D Institutions

The development of the multilateral research and development (R&D) institutions represents an enormous investment of resources and a considerable pool of expertise. The magnitude of the figures involved, and also the tremendous potential they represent, make it important to consider the effectiveness and the opportunity cost of the resources used. This can only be done on an institution-by-institution basis — considerably beyond the scope of this limited survey. It may, however, be useful to outline some features that provide a broad framework for future institutional assessment. This section examines briefly the reasons for the creation of these institutions and the role they play before raising a number of issues related to their continued development and effectiveness.

In addition to the clear applicability of a multilateral approach to research activities, there have been, of course, precise considerations lying behind the increased resources to multilateral, research-related institutions:

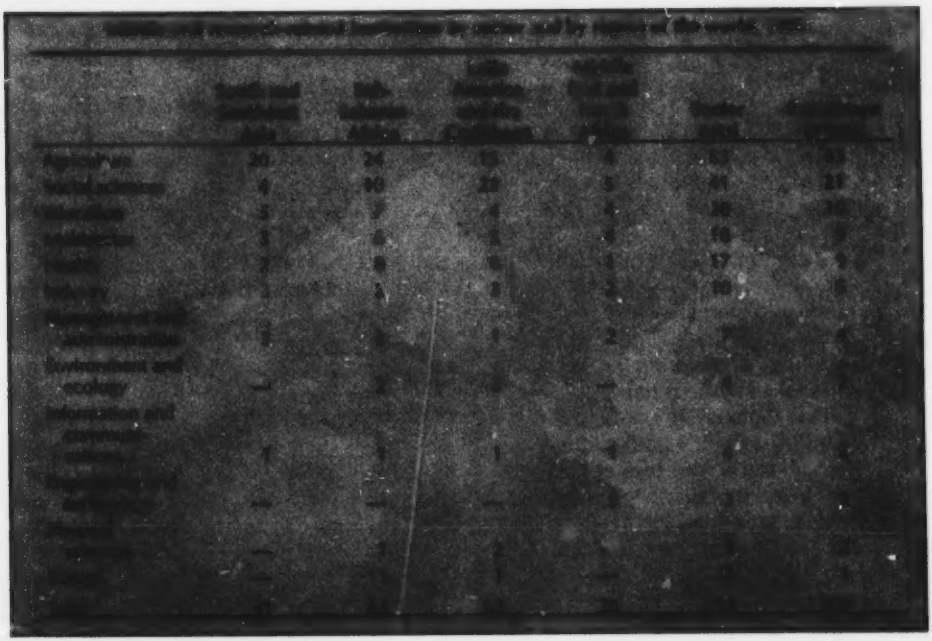
Information flow — During the colonial period, research in colonial territories was usually managed directly by, or supervised from, the metropolitan capital. A certain distribution of information throughout the colonial territories was assured using the capital as the focal point. Independence meant that there was a need to replace and widen these channels, so that exchange of information was no longer restricted to one colonial sphere of influence. Multilateral centres provide new channels of information flow that are not dominated by one country.

Colonial legacy on research agenda — The colonial era also set a research agenda that took excessive account of the colonial power's interests. Consequently, there was a need to move quickly to focus research on areas of interest to the developing countries. There was also the feeling that where the metropolitan countries had supported scientific work of interest to the colonial areas, the resources devoted to these fields might diminish after independence (e.g., tropical health).

Weak infrastructure in developing countries — With inadequate infrastructure and capacity in developing countries, multilateral institutions could perform important services to national R&D through undertaking research and assisting in building research capacity.

World-class research — There was also the idea of bringing world-class research to bear on intractable development problems. By providing excellent facilities, and attracting scientists of world standing, it was felt that multilateral institutions could contribute to making a real breakthrough on some major development problems.

Proven productivity — The positive image of the utility of multilateral research was further reinforced by some highly successful research, particularly in the agricultural field, undertaken by international centres.



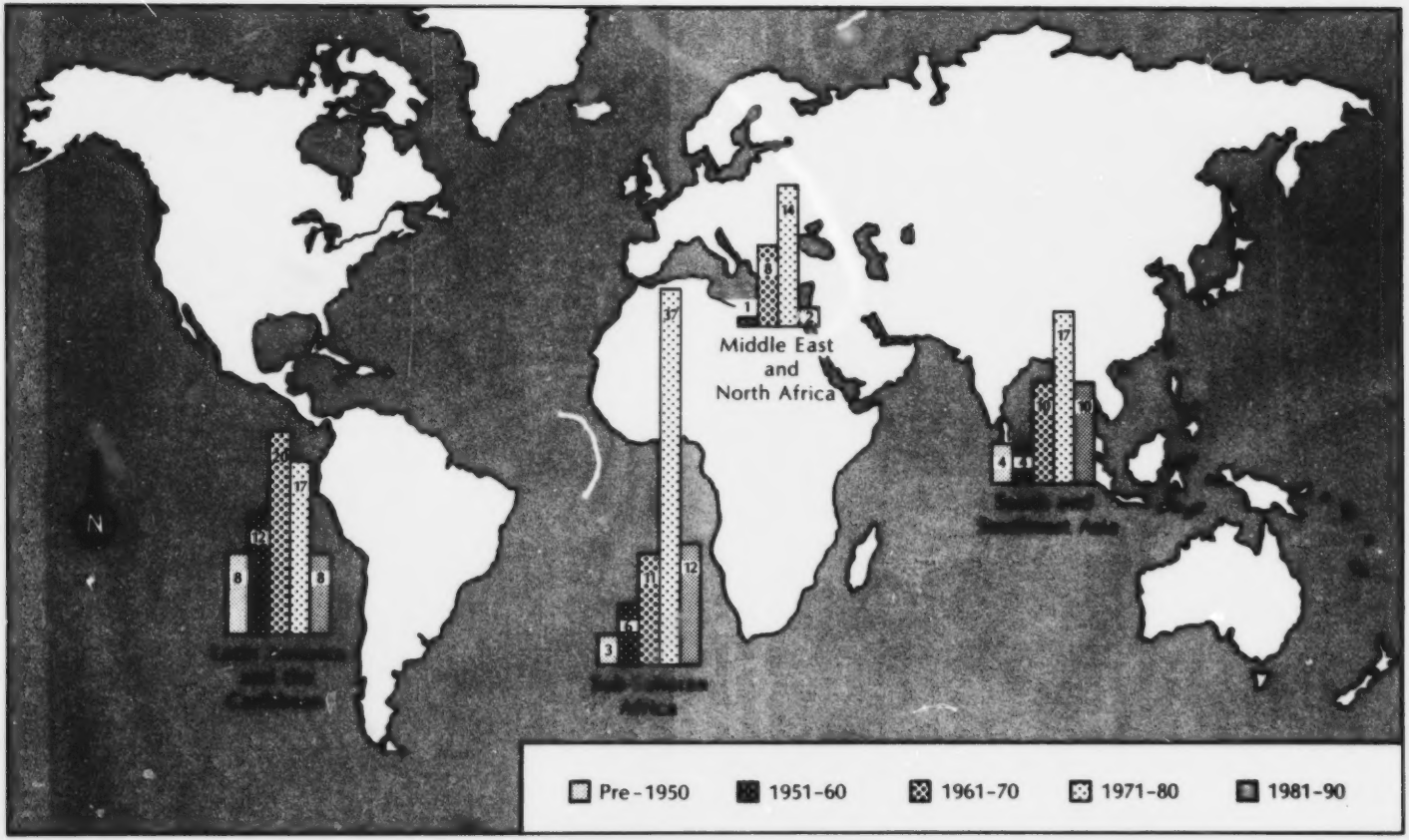


Fig. 3. Multilateral research-related institutions by region and date of establishment. (The projection for 1981-90 is based on 1981-85 experience.)

The sections that follow concentrate on those institutions classified as "research institutions," although some of the analysis may be extended to the "research-complementing" ones as well. The main functions of the multilateral research institutions have been to undertake research for development and to provide support to national systems; given that the set of institutions identified accounts for a significant quantity of resources, there are a number of issues that warrant consideration. There is a brief discussion of the following:

(a) Payoff (productivity and effectiveness) from the institutions,

(b) The need for a concerted view of the priorities for funding,

(c) The relations of these institutions to national research, and

(d) Cost-effective alternatives to the creation of new research institutions for ensuring the multilateral dimension in research.

The *first* major issue is that relating to the payoff (productivity and effectiveness) from the considerable resources invested. By their very nature, the multilateral institutions have often been drawn into a higher cost pattern (higher salaries, better facilities) than prevails in developing-country national research, and the expectation has always been that their product would compensate for the higher costs. Most are still recent creations, and they have not yet had adequate time to provide good-quality research that can feed into countries' development; a recent U.S. Agency for International Development (USAID) publication (*Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa, May 1985*) recalls that "although the beginning of a formal public-supported agricultural research process dates [in USA] to 1861, results in terms of increased yields did not begin to appear until the 1930s . . . ." The mid-1980s are seeing increasing attention paid to the "effectiveness" of aid generally in the development process as shown by the Cassen Report on Aid Effectiveness commissioned by the IMF/International Bank for Reconstruction and Development (IBRD) Task Force on Concessional Flows and by the existence of the Task Force itself. As might be expected, similar concerns have been voiced with respect to the research institutions, although these have been directed for the time being at the IARCs because they are the best known, the most easily identifiable, and account for a substantial proportion of total funds to multilateral research.

The CGIAR recently completed a major study on the "Achievements and Potential of the International Agricultural Research Centres" that represents one of the largest reviews ever undertaken of the performance of a set of research centres. The contribution, high payoff, and impact on increasing food production of some of the IARCs work particularly on rice, maize, and wheat are well documented. The CGIAR study also devotes considerable attention to the role of the IARCs in building research capacity in developing countries.

In addition to agriculture, there are signs of significant developments in other fields — the International Centre for Diarrhoeal Disease Research — Bangladesh (ICDDRB), for example, contributed to the major development of oral rehydration therapy and is now working on the field trials of a new oral vaccine for cholera. Equally, not all work undertaken by multilateral institutions relating to research provides for such tangible products as vaccines and high-yielding crop varieties. Although the available evidence is not comprehensive enough to show that significant benefits are being derived from all institutions, and undoubtedly many could improve their present effectiveness, the limited evidence does indicate that they can perform a valuable

supplementary and complementary role to national programs.

A *second* issue concerns the need to establish a broader framework in which to examine relative research priorities and requirements before expanding existing or establishing new centres. Although any one individual institution may be addressing a significant development issue and may provide a significant return on investment over time, there are opportunity costs in terms of other research issues and national program needs that could also benefit from more resources.

Most existing institutions receive much of their funding from ODA resources that have shown limited real increases in the last decade. Although developing countries provide some support, particularly to regional centres, and this may increase in the future, it appears that most of the funding for these centres will continue to come from ODA sources. Thus, expansion of existing centres and proposals to create new institutions, both to fill major gaps and to respond to new challenges such as in energy or biotechnology research, must increasingly take account of total resource limitations. To date, there appear to have been few attempts to establish new institutions in terms of any relative priority between sectors; even within one sector, information and mechanisms by which to make such assessments are weak.

The CGIAR provides a notable exception where a more concerted approach within one sector has been used in funding the work of 13 IARCs on the world's major food commodities. A mechanism exists for allocation decisions to be made explicitly on the priority accorded to different commodities and different areas of research.

A *third* issue concerns the relationship of these institutions with national research in the developing country. Whatever the potential of the research and support they provide, its actual use in national development or decision-making can only be as effective as the national research system with which the institutions interact. There is, therefore, a balance required between support to these institutions and support for building research capacity and facilities at the national level. They are sometimes considered as competitors to national systems for donor support. One study has even described them as the "main stations" of Third World research, with national research as the "branches," whereas clearly multilateral research centres must support and strengthen national programs. Another study some years ago indicated that the growth of multilateral research has been financed largely by an increase in funding for research, although there appeared to have been some modest reduction in funding for national programs.

Equally, there are cases where funding to multilaterals has actually brought forth increased complementary funding to nationals. The competitive element should not be exaggerated. IDRC is currently supporting a study to estimate the overall funding provided by major donors to support development research. This should permit a more informed judgment on the proportion of overall funds available to support development research that is going to multilateral institutions.

A second element of the relationship is consideration of the actual services provided to national research. In the past, the creation of new multilateral institutions may not always have given adequate consideration to what research and research services would best enhance national efforts. Some initiatives may have been dictated by "supply" considerations, i.e., the identification of an important research subject that would benefit from the concentration of resources implied by creating a regional or international institution. In such cases, consideration of the most appropriate

focus in light of national systems' needs has only come after the new institution is established.

With an increasing awareness of the importance and growth of national research programs, multilateral institutions must strive to maximize their support to national research systems. With the increasing heterogeneity of national systems' capabilities and requirements, however, these centres are facing an even greater range of demands on their services — this can be illustrated by the CGIAR review's suggestion that the IARCs may have to move into more basic research to support sophisticated national systems (e.g., in Brazil and India), while providing all the traditional supports to other countries. Clearly, many of the smaller countries (80% of those in sub-Saharan Africa and in the Latin American and Caribbean region have populations of less than 10 million) are unlikely to be able to afford a set of national research institutions that will span in depth all the problem areas in which they require research. Some recognition of interdependence and of the benefits through pooling research resources to achieve critical mass is clearly desirable for those countries in particular.

A *fourth* issue links to the preceding one: given their importance to national research, how can multilateral consultation and backstopping be provided most cost effectively? The creation of new regional and international institutions, particularly research centres, has been costly. In consequence, there has been an increasing tendency to emphasize models of international and regional cooperation that allow for adequate coordination without creating major facilities requiring substantial, long-term international funding. These approaches reduce the large capital and operating costs of research centres by concentrating on *networking* and pooling the use of existing *national* resources and facilities. Some recent examples that contain elements of this approach are: the International Council for Research in Agroforestry (ICRAF), the International Board for Soil Research and Management (IBSRAM), the International Irrigation Management Institute (IIMI), the International Network for the Improvement of Banana and Plantain (INIBAP), and the regional concerted research program being undertaken by the countries of the SADCC, where each member country takes leadership responsibility in one area. The Southern Africa Centre for Cooperation in Agricultural Research (SACCAR), for example, is located within the Ministry of Agriculture in Botswana.

IDRC and Multilateral Research

IDRC has actively encouraged and participated in the creation of several international and regional research institutions; indeed, few donor agencies have been more active in this area. The Centre played a role in the activities leading to the establishment of three out of the five organizations mentioned in the preceding paragraph. The Centre has made an effort to ensure that proposed new centres are carefully justified and merit support before it becomes involved in supporting their establishment. Where support has been provided for ongoing programs, it has been directed at increasing the links between these centres and national systems. Support for multilateral institutions has to be justified on the basis of complementing and reinforcing national research programs.

Despite this active support, the Centre has directed an increasing proportion of its resources over the years at national programs in developing countries. The sections that follow document some of the Centre's activities in support of both national and multilateral institutions.

WHAT IS IDRC?

The International Development Research Centre (IDRC) is a corporation created by the Parliament of Canada in 1970 to stimulate and support scientific and technical research by developing countries for their own benefit.

The fields of investigation to which IDRC gives its financial and professional support include: farming; food storage, processing, and distribution; forestry; fisheries; animal sciences; energy; tropical diseases; water supplies; maternal and child health; education; population studies; economics; communications; urban policies; science and technology policy; and information systems.

Although IDRC is funded entirely by the Canadian Parliament, to which it reports annually, its operations are guided by an international 21-member Board of Governors. Under the IDRC Act, the chairman, the vice-chairman, and nine other governors must be Canadian citizens; in practice, 6 of the remaining 10 governors are from developing countries.

The Centre's programs help developing countries to build the scientific competence of their institutions and their researchers so that these countries can work to solve their own problems. Opportunities are given to researchers to broaden their experience through further specialized study or on-the-job training.

IDRC emphasizes the role of the scientist in international development and encourages Third World countries to draw on the talent of their own scientific communities. Building a strong local base for future research is an important objective of most IDRC-supported work. Research projects are identified, designed, conducted, and managed by developing-country researchers in their own countries, to meet their own priorities.

IDRC helps to create and supports international research networks through which developing countries can learn from each other, share common experiences, and conduct similarly designed studies in areas of mutual concern. It also promotes cooperation between developing-country researchers and their counterparts in Canada.

Research Programs

Agriculture, Food and Nutrition Sciences — In this group of related sciences, emphasis is on farming systems, social forestry in arid and semi-arid lands, and aquaculture. Specific areas of support include: previously neglected food sources such as root crops, food legumes, and oilseeds; agroforestry (growing trees and crops together); multiple cropping systems; improvement of pasture lands; use of nonconventional feeds for animals; fish and shellfish farming; postproduction systems for the preservation, processing, and distribution of food crops, fruit, and fish; and the economics of small-scale farm production and marketing.

Health Sciences — The division's support is concentrated in five broad areas of applied research: water supply and sanitation; maternal and child health; tropical and infectious diseases; occupational and environmental health; and health services research.

Social Sciences — Research supported by the division is designed to improve understanding of the social and economic issues related to international development, permitting researchers and policymakers to formulate policy options in several thematic areas. These include: education, population, science

Drought forces nomadic peoples to change their lifestyles.

and technology, energy, urban development, economics, and rural development. Support is also given to a limited number of national and regional institutions in the social sciences and to research on problems of special regional concern.

Energy — The worldwide effects of unstable energy supplies and prices in recent years have underlined the urgent need for increased research on the energy problems of those most adversely affected — the developing countries. One of IDRC's major activities in this area has been the coordination of an international Energy Research Group comprised of 10 energy analysts and policymakers from developing countries. Funded jointly by IDRC and the United Nations University in Tokyo, the Group has been working to identify energy research priorities for developing countries and to suggest how national, regional, and international research resources can be better allocated.

Information Programs

Information Sciences — Support given by the division helps developing countries to: establish regional and national information systems and improve library infrastructures at these levels; participate in international information networks; create specialized information centres (serving the region or world) on development-related subjects; strengthen sectoral information programs, especially in agriculture, health, population, industry, the environment, cartography, and social issues; and develop information tools and methods. The division's computer systems group provides internal services and distributes MINISIS, a bibliographic software package designed by IDRC, to developing countries. In addition, a library

and micrographics unit serve IDRC staff, the Canadian development community, and IDRC-supported projects.

Communications -- Services provided by the division include: the publication and dissemination of the results of IDRC-supported research via print and film media, public affairs, and translation. The division also supports projects aimed at strengthening the ability of research institutions and communications media in developing countries to prepare and disseminate scientific and technological information.

Collaborative Programs

Cooperative Programs — The division promotes collaboration between scientific research groups in developing countries and their counterparts in Canada — whether academic, governmental, or private. By establishing channels of communication among scientists, the division helps improve the transfer of research results from Canada to the Third World. However, project support is open to all disciplines that contribute to Third World economic or social development and in which there is recognized Canadian expertise. It is important that the developing-country research group play a significant role in formulating a scientifically sound project proposal and in planning and executing the project, thereby strengthening its research capacity.

Fellowships and Awards — The division funds the training of junior and senior Third World scientists, managers, and planners working in sectors covered by IDRC's program divisions. Preference is given to individuals from the least developed countries and the emphasis is on professional upgrading rather than basic training. In addition, the division supports practical, nondegree group training to improve technical, research, and administrative skills of individuals. A portion of the division's funds is also used to encourage the involvement of young Canadian researchers in scientific areas of concern to IDRC and to expose them to the problems of the developing world. These doctoral students are posted to a Third World country for studies, research, or placement.

Funding and Selection of Projects

Each program division channels funds to institutions in developing countries (government departments, universities, research centres, etc.), to international and regional institutions, and to Canadian institutions. The recipient is expected to pay a portion of the costs.

All projects are reviewed by IDRC's professional staff and assessed in light of factors such as:

- Development priority: Is the proposal consistent with national or regional development goals?
- Regional applicability: Are the research findings likely to be applicable in developing countries or regions other than the one in which the research takes place?
- Usefulness: Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Local resources: Will the project make full use of local resources and research workers from the region?
- Training: Will the project result in better trained and more experienced researchers and more effective research institutions?
- Research area: Does the research fall within IDRC's areas of concentration?

When IDRC agrees to support a project, it enters into an agreement with the developing-country institution. In it are stipulated the project's purpose, research methods, payments, and a

schedule for the research and progress reports.

The Program Officer

Although IDRC itself rarely undertakes research, its program officers are highly qualified professionals. One of their main functions is to respond to project ideas proposed by developing-country researchers and to evaluate the suitability of proposals in light of the criteria stated above.

Once a project has been approved in principle, the program officers collaborate with the institution submitting the proposal in further refining the project idea, provide administrative and technical advice, and help in preparing a project budget. Program officers are based either at IDRC headquarters in Ottawa or in one of the regional offices. In the regions, they help determine research priorities and prepare detailed annual plans of projects to be defined and developed, workshops and seminars to be organized, and maintain contact with research institutions throughout the region.

Project Approval

Before funds are appropriated, a project proposal must go through a formal approval process.

Authority to approve projects for which funding exceeds $100 000 lies with IDRC's Board of Governors. It delegates approval authority to the President and the Vice-Presidents for projects up to $100 000, to Directors of individual divisions for projects up to $50 000, and to Deputy Directors for projects up to $15 000.

When a project has been approved, funds are appropriated by the Office of the Comptroller General and Treasurer. The Secretary's Office prepares a Memorandum of Grant Conditions (MGC) governing all aspects of the relationship between the signing parties. Once the MGC has been signed by the recipient, funds can be forwarded.

The Needs of Farmers

IDRC was created to serve the needs of the poor of the developing countries, particularly the rural poor. Its immediate clients and beneficiaries, however, are those countries' scientists. The Centre's program staff are constantly seeking better ways to support them, both financially and intellectually.

One significant expression of the great importance placed by the Centre on the many contributions made by Third World scientists toward solving the problems of the developing countries was the "Symposium on Drought in Africa," organized by IDRC in Ottawa in August 1985.

The objective of this meeting was to provide a forum for 20 African scientists. Over a period of 3 days, these researchers made headlines in Canada's news media as they explained, from their point of view, the crisis that has gripped their continent. And, above all, they stressed that they themselves are prepared to work for solutions, in particular by channeling the results of agricultural research to the millions of peasant farmers. Indeed, unless Africa develops its own experts, how can it possibly hope to utilize modern technology, not just for its survival but for its development? The symposium in Ottawa once again clearly demonstrated the essential role that scientists have to play in each country's national development.

Ultimate Judges of Research

In the past 15 years, the Agriculture, Food and Nutrition Sciences Division has evolved a number of mechanisms for linking itself with those scientists closest to the users of agricultural research. These include: posting program staff to the Centre's six regional offices, creating informal networks of researchers, and supporting on-farm research with the farmers as active partners. These mechanisms serve to illustrate the theme of this 1985 edition of IDRC's annual review of its activities.

Among the four main kinds of actors on the international research scene — funding agencies and international, regional, and national research centres — the Division has listened first to the national institutions. It made this choice because scientists in national programs are the ones closest to the farmers who, by rejecting or accepting new cropping systems, for example, continue to be the ultimate judges of the results of agricultural research. When the results are practical, productive, and profitable, the farmers do adopt them with surprising alacrity.

Scientists in the least-privileged countries are the ones in greatest need of aid because they are isolated, underequipped, and underpaid. To them, simply knowing there is an organization with considerable resources at its disposal, which is ready to listen to them, is a great source of hope. Throughout 1985, the Agriculture, Food and Nutrition Sciences Division made a significant effort to respond to that hope.

The Poor Man's Steak

In Asia, the Division continued its support for a number of research projects on protein-rich foods such as the pulses, mainly beans and peas. These contain up to 30% protein and are an important part of the diet of the poor. Beans and peas also draw their nitrogen from the air, which diminishes the need for expensive fertilizers. Despite these qualities, it is only relatively recently that pulses have become a subject of research in developing countries. Consequently, these

crops had been pushed out into marginal land, and peasants had preferred to put their best efforts into high-yield rice and other grains of the "green revolution."

In Bangladesh, the average daily availability of leguminous proteins is no more than half the recommended adult requirement of 15 g because it is so much more profitable to produce wheat or rice. As a result, the Bangladesh Agricultural Research Institute decided to improve several varieties of pulses. It has already achieved a number of useful results, particularly with khesari, a pulse that resembles sweet peas but which also contains neurotoxic substances. Khesari (*Lathyrus sativus*) is an important element in the diet of the poorest people and an especially hardy food crop. This explains the current interest in those strains discovered by the Institute to contain low amounts of harmful substances.

Specialists of the Nepali Department of Agriculture are also trying to reverse the trend away from food legume crops by giving priority to improving the yield of chickpeas, lentils, and soybeans. Thanks to IDRC funding, they will have easier access to the most recent strains bred by the major IARCs.

In the case of Pakistan, disease has been the main reason for the considerable decline in the yields of pulses. Support given to the Pakistan Agricultural Research Council will help identify varieties of mung bean (from which bean sprouts are grown) and chickpeas that are resistant to cercospora and ascochyta blight.

Thailand, an exporter of rice and cassava, depends on yet another pulse, peanuts, as an alternative to cassava for farmers in the northeast of the country. The cassava, which was traditionally exported to Europe, no longer has a market there. IDRC's contribution will enable the faculties of agriculture at Khon Kaen and Kasetsart universities to experiment in breeding varieties of peanuts adapted to conditions in the northeast region.

Sometimes, results surpass all expectations, as was the case with cowpea research funded in Burkina Faso (formerly Upper Volta) over the last 8 years. The head of the research team achieved a major breakthrough by breeding a variety of cowpea that is resistant to the parasitic weed, striga. He is now breeding this characteristic into other strains of cowpea that, in turn, have the advantage of being less attractive to bruchids, small insects that can turn the entire contents of a silo into empty husks. This project is administered by the International Institute of Tropical Agriculture (IITA) in Nigeria which is now

This West African researcher describes the advantages of his new cowpea varieties.

disseminating the cowpea strains bred in Burkina Faso to numerous other countries.

The results obtained are of great significance because cowpeas are highly resistant to drought. In the sub-Saharan countries, they are the prime food of the rural poor and are also eaten as fritters on the streets of the large cities. In general, with research making little progress to increase the drought resistance of many plants, any improvement to a plant that is already drought resistant, such as cowpeas, is extremely important for Africans.

The African Dehuller

Two cereals, millet and sorghum, are also drought resistant. There had been a tendency to replace them with imported cereals, but they are now regaining their former prominence. Processing them, however, is extremely difficult. It takes an hour of hard physical labour to dehull each kilogram of millet or sorghum, and women are increasingly reluctant to undertake such a trying task.

To bring these cereals back into favour with consumers, the Agriculture, Food and Nutrition Sciences Division began funding the development of a simple, sturdy dehuller for millet and sorghum some 10 years ago. Thanks in part to the Division's efforts, there are now 21 small mills in Botswana using 36 of these dehullers. The new millers have even set up their own Botswana Mill Owners' Association. IDRC will fund a study to summarize their experience to enable Botswana's Rural Industries Innovation Centre, which has manufactured most of the dehullers, to improve both the performance and the safety of the machines.

Another grant, to a nongovernmental organization (NGO) in Gambia, Catholic Relief Services, will provide it with an opportunity to learn how to build a smaller version of this machine. Another project will enable the National Research Council in Kampala to introduce this technology into Uganda.

In the Middle East, the Division will support an ambitious research project at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria. The purpose is to improve and test two promising prototypes of lentil harvesters. When lentils ripen, the pods of this very important dry legume fall to the ground. Farmers have to harvest them all in a few days, and labour is a major obstacle to production. The workers' wages are now so high that it is cheaper to consume imported produce. A harvester appropriate to the needs of the countries in the region would make it possible to resume lentil production, which would ultimately provide jobs that are now being lost to those countries from which the food is imported.

Before and After the Rice Crop

The high-yield rice varieties now being planted by peasants all over Asia produce larger crops in less time — usually 100 days rather than the 160 needed by traditional varieties. The rice paddies are thus freed up for other crops: cereals (wheat, corn, sorghum) and pulses (beans, peas, cowpeas, soybeans, peanuts).

Beginning in the mid-1960s, researchers undertook a search for new cropping systems whereby other crops could be planted before and after the rice so that the paddies and fields could continue producing throughout the year. At the International Rice Research Institute (IRRI) in the Philippines numerous sequences have been tested: rice/corn, rice/wheat, rice/pulses, rice/soybeans/wheat, etc. But even after experimenting on test plots with numerous rice-based systems, certain questions, which are at the heart of the controversy about the "green revolution," remained unanswered. Can peasant plots support such sequences? Do peasants have the means and the knowledge to use these

Specialists from about 15 Asian countries regularly visit the International Rice Research Institute in the Philippines for advanced training.

more complicated cropping systems? Are the new methods and varieties being proposed by researchers really appropriate as replacements for the traditional cropping systems? There was only one way to answer these questions: test the new systems on farmers' plots, with the help of farmers.

Scientists need a particular measure of courage if they are to carry out their experiments in full view of those they mean to help. In many areas of the world, researchers are often clustered together in the artificial environments of research stations where they produce beautiful reports but little else. Those Asian scientists who decided to roll up their shirt sleeves and venture out into "real" farmland found a supportive partner in IDRC.

Since 1975, the Agriculture, Food and Nutrition Sciences Division has expanded its support of such on-farm research methodology. In 1985, the Division renewed its support for what has become the Asian farming systems network. About 50 sequences of crop species are currently being tried out in 15 Asian countries, including China.

By continuing to support the Asian farming systems network, IDRC hopes to ensure the development of genuine research capabilities at the national level. There has been concern that research might become too centralized, with scientists in national agricultural research centres being limited to passively applying ready-made answers imported from international research centres. The new funds granted to IRRI for the network program are intended to avoid this by helping national researchers become full-scale partners of international specialists.

Bananas are Vegetables Too

For breakfast, sliced bananas fried in oil; for lunch and dinner, boiled bananas along with the main dish. In the tropics that is how people eat plantains, close cousins of those sweet

bananas that are exported in bulk to the temperate countries. The big leaves of banana trees and plantains also provide shade for almost every peasant home in the rural areas of the humid tropics. Out of every 10 bananas consumed in the world, only one is an export product. Research, however, has only just begun to focus on those bananas, and particularly plantains, eaten at home.

Recently, the disease cercosporiasis (black sigatoka), has been decimating the trees of banana growers who cannot afford expensive pesticides. The Agriculture, Food and Nutrition Sciences Division, which funded research into plantains in Cameroon about 10 years ago, is now supporting other research in Honduras and Costa Rica. In the last few years, the Fundación Hondurena de Investigación Agrícola, in La Lima, has been able to identify several strains of plantain that resist black sigatoka. A genuine breakthrough seems possible and the support of IDRC will help this very promising research to continue.

The funding granted to the Tropical Agricultural Research and Training Centre (CATIE) in Costa Rica will be used to test multiple cropping systems that link plantains and root crops. The work at the Centre, which is regional in scope, will be done in collaboration with the staff of the Panamanian and Nicaraguan national programs. Specialists from the University of the West Indies in Trinidad and Tobago and from the branch office of the Institut national de la recherche agronomique (France), in Guadeloupe, will also contribute.

All these projects will be coordinated by a new international organization that the Agriculture, Food and Nutrition Sciences Division helped establish after several funding organizations asked IDRC to create and guide the early endeavours of the International Network for the Improvement of Banana and Plantain (INIBAP).

This network will be a modern variation of the IARCs established in the 1960s and 1970s. Instead of taking the form of a large complex of laboratories and test plots grouped together in one place, the new structure will essentially consist of four regional networks coordinated by a director and a very small administrative team. A decentralized structure of this kind is essential for plantains, which are grown in a wide range of environments. The success of this new experiment in the mobilization of such decentralized agricultural expertise will depend very much on the drive and energy displayed by the national research groups.

The director of INIBAP will be based in the office of CIRAD (Centre de coopération internationale en recherches agronomiques pour le développement), in Montpellier, France. IDRC has undertaken to provide part of the cost of the organization's first 4 years of operation. This will involve

Chinese fish farmers are masters in the art of raising carp.

far less expenditure than for a large international research centre.

Exporting Chinese Wisdom

Over the centuries, Chinese fish breeders have perfected inexpensive methods for enriching the water in which their fish grow. About 200 kg of silkworm excrement, for example, helps produce 25 kg of fish, or 15–45 pigs can fertilize 1 ha of hatchery ponds. Silver and bighead carp can also feed on aquatic plants fertilized by the droppings of grass carp, or directly on the droppings themselves.

In the lower courses of the Changjiang and Zhujiang rivers, the best fish farmers in China produce up to 15 t of fish per hectare, using the droppings from their domestic animals. The average output in China, however, is only 1 t/ha, and many fish farms produce less than 700 kg/ha.

This wide variation results from the fact that certain local conditions are not taken into account when these methods are exported to provinces of China where the agroclimatic conditions differ. If these methods are to be adapted, however, there has to first be scientific understanding of the behaviour of fish in an environment saturated with animal manure and organic waste.

The Agriculture, Food and Nutrition Sciences Division will fund the work of the Asian–Pacific Regional Research and Training Centre for Integrated Fish Farming, a regional centre established at Wuxi, north of Shanghai, with assistance from regional organizations. Because the Division has been increasingly stressing the importance of training researchers, IDRC's Fellowships and Awards Division has undertaken to offer 10 scholarships a year for 2 years to researchers from other Asian countries so that they can train at Wuxi. Eventually, another network of projects associated with this Chinese centre should take shape with support from IDRC.

In the shorter run, researchers at the Freshwater Fisheries Research Station at Comilla, Bangladesh, will form one of the first links in this network. The Agriculture, Food and Nutrition Sciences Division has decided to support their work on the Hilsa, a fish that, in a country rich in river meanders and ponds, is the main source of protein. There is intensive artisanal fishing for Hilsa, but practically nothing is known of its biology, its breeding grounds, or its migrations. If Bangladeshi scientists learn more about its behaviour, they will be able to devise policies for scientific management of the stock. There are also plans to investigate the possibility of domesticating Hilsa and cultivating them on fish farms.

Before they can start the breeding process, however, fish farmers will have to clean up the water. Asian countries currently import tea-seed cake at great expense to get rid of undesirable species before seeding the ponds. There are dozens of local plants, however, that kill fish and have been identified in India, Nepal, and Thailand. The Division will use funds from IDRC's Cooperative Programs to enable Third World and Canadian specialists to collaborate on research to analyze the characteristics of these plants. The work will be conducted at Prince of Songkla University in Thailand, in cooperation with chemists at the University of British Columbia in Vancouver.

Sea Urchins and Shellfish

Until recently the Agriculture, Food and Nutrition Sciences Division had not been much involved in funding work on sea urchins and shellfish — with the sole exception of oysters, which are already a part of the diet of people living on the banks of the vast tropical mangrove swamps. Now, however, if it is clear that small-scale fishermen or fish farmers will benefit, the Division will be keen to support national research on these extremely profitable species.

The Division has thus responded favourably to a request by researchers at the Universidad Austral de Chile, at Valdivia, who are seeking to improve the storage, processing, and transport of oysters and mussels from Chiloé, a very poor island in the south of the country. The Pontificia Universidad Católica de Chile will also be supported in its efforts to produce a model for the management of ocean products that should eventually improve the lot of 80000 families along the Chilean coast.

In Jamaica, where oyster research supported by the Division has had excellent results, the new oyster-farming industry is struggling to overcome a lack of seed oysters, as very young oysters are called. A well-adapted system of breeding them, developed in previous projects, has been adopted by the coastal population who get their supplies of seed oysters from one location, Bowden Bay. Oyster larvae cling to and grow well on pieces of old tires arranged in submerged baskets. After 2 months, the strings of tire pieces, covered with young oysters, are gathered and suspended from rafts floating in numerous other bays of the island nation. After another 2 months, the oysters are ready for sale at a price of $1/kg. This is an extremely profitable and rapid operation compared with oyster farming in the temperate countries.

Bowden Bay, however, can no longer meet the demand and is also threatened with the disturbance of its waters because of the establishment of a new banana port. The Agriculture, Food and Nutrition Sciences Division has thus undertaken to fund cooperative research into other methods of seed oyster production, which were devised at the University of the West Indies in Kingston in collaboration with specialists at Dalhousie University in Halifax, Canada.

In another project, Canadian researchers from the University of British Columbia will help their counterparts at the National Environmental Protection Council in the Philippines where the coastline near many towns is severely threatened. Three major marine ecosystems — coral reefs, mangrove swamps, and seagrasses — are disappearing rapidly. The purpose of the research is to restore the seagrasses, thereby protecting the coast from erosion and restoring the habitat of numerous marine species.

In the Middle East, on the Red Sea coast, the Division will also continue to support a group of Sudanese researchers who are working in extremely difficult conditions to revive the cultivation of pearl oysters (renowned for mother of pearl). These have greatly diminished since the 1960s because of diseases that remain a mystery.

Farmyard Animals

When larger animals are decimated by diseases such as trypanosomiasis (which in humans is called sleeping sickness), part of the loss in animal protein in the local human diet can be made up from small rodents, which can be protected from infection by being kept in separate cages. The Agriculture, Food and Nutrition Sciences Division has, consequently, begun to fund research into the breeding of rabbits in East Africa and guinea pigs in South America where they are already part of the diet of the populations of Andean countries.

In the Morogoro region of Tanzania, people consume very few dairy products and little beef because of the ravages caused by trypanosomiasis, which is transmitted to animals by the tsetse fly. Researchers at the Sokoine University of Agriculture are convinced that breeding rabbits as an alternative is the solution. For about 10 years they have been examining a variety of ways to feed the rodents. Their work is well known and more and more Tanzanians are coming to them to ask for breeder rabbits. Many rural families breed three or four rabbits at a time in their yards, feeding them on kitchen scraps and wild

lettuce. The support of the Division will enable the Tanzanian team, in close collaboration with small-scale farmers, to test its models for the farmyard breeding of rabbits. Once the new breeding systems have been tested, they will be disseminated through the schools. It gives the Division the greatest satisfaction to support African researchers who are keen to work side by side with the potential users of their research.

In El Salvador, one of the Central American countries most affected by armed struggle between government troops and guerrillas, it takes considerable courage for a researcher to visit the rural areas and interview farmers. Until now, native breeds of swine in the interior of the country have never been studied systematically.

Specialists from the Salvadorian Ministry of Agriculture and Animal Husbandry, with the support of the Institute of Nutrition of Central America and Panama (INCAP), in Costa Rica, have begun the study of "negro," "parchado," and "chino" swine. They will also have the backing of specialists at McGill University in Montreal, thanks to an IDRC cooperative project. The researchers will allow themselves 3 years to provide breeders with better methods for fattening their swine. The project will also produce information bulletins for extension workers and farmers.

Recycling Farm By-Products

IDRC has supported the establishment of an African agricultural by-products research network. The common element is the attempt to make use of crop residues and agricultural by-products in feedstuffs. This network, which is coordinated by the International Livestock Centre for Africa (ILCA) in Addis Ababa, Ethiopia, now

Most East African farmyards sport a rooster and a flock of chickens. Soon, the fowl will be joined by rabbits, another excellent source of protein.

includes six national projects funded by IDRC and several teams from other countries that are members of the network.

The Agricultural Research Institute of Nicosia, Cyprus, has just joined the network, with the aid of a grant from IDRC. Researchers from this Mediterranean island will study the feeding of dairy cattle on barley straw enriched with urea. In other tests, cattle will be fed on citrus pulp or grape marc (the residue after the juice has been extracted) mixed with poultry manure. The results from Cyprus, which are almost complete, will be of great interest to breeders in North Africa and the Middle East. The work should benefit all the members of the network.

In Latin America, another series of projects on animal-production systems is developing into a major network. The 10 national projects involved are linked to two international centres, CATIE in Costa Rica and the International Centre for Tropical Agriculture (CIAT) in Colombia.

By devising an on-farm methodology for animal sciences research, the scientists participating in the network are trying to do for animal husbandry what their Asian colleagues have managed to do for crops.

An important project of the Latin American animal production systems network, in Costa Rica, involves agroforestry. In the largely undeveloped regions of the country's Atlantic coast, where 70% of the forest is still virgin, the environment is undergoing total transformation. New settlers cut down the trees and then raise livestock on rapidly deteriorating land. The CATIE researchers will try to bring agriculture and livestock raising into harmony with the environment by reintroducing trees to farms. For the first time, CATIE scientists from a variety of disciplines will work together. If this ambitious project succeeds, it could provide an ecologically sound model for tropical farming, with long-term viability.

A number of Third World governments have already begun reforesting their countries' deteriorating regions and some are tackling areas in the process of desertification. A relatively modest grant is helping a researcher at the Pontificia Universidad Javeriana in Bogotá, Colombia, to produce clones of promising trees rapidly. She will use the in vitro tissue-culture technique that, in Brazil, has made it possible to produce 12.5 million seedlings within a short period as part of an enormous reforestation project. This is the third tissue-culture project — the other two are in Sénégal and Malaysia — to be supported by the Divison in an effort to help developing countries master this advanced form of biotechnology. In Colombia, the supply of seeds is a bottleneck in reforestation programs. A grant will help the Corporación Nacional de Investigación y Fomento Forestal to stock and produce more seeds, and to collect seeds of important local tree species.

African foresters are also launching more and more reforestation programs and have to face the same seed supply problem. The Division has already given its support to the creation of a regional seed bank in Zimbabwe for the Southern and East African countries. In the past year, the Division made efforts to stimulate forestry research in three East African countries by offering a series of modest grants of $10 000 — over 2-year periods — to researchers at universities in Kenya, Uganda, and Tanzania. Another activity administered by the Agriculture, Food and Nutrition Sciences Division is a 3-year reforestation project begun by an NGO in Botswana. Financing for this will come from a special $10 million fund set aside for energy research, the management of which was entrusted to IDRC by the Canadian government.

The Divison has also approved a project in an area of research that is currently arousing a great deal of interest — mycorrhiza. Mycorrhizae are symbiotic associations of fungi with

roots, ranging from those of the smallest vegetables to the largest of trees. They are now known to affect almost all plants. In essence, the fungi help plants to draw more phosphorus from the soil. Researchers at the Faculty of Forestry and Surveying at Laval University, in Quebec, have made notable advances in this field. They will be collaborating with researchers at the Division de recherche et d'expérimentation forestière de Rabat, in Morocco, in studying the mycorrhizae of Moroccan conifers.

During 1985, the Agriculture, Food and Nutrition Sciences Division funded a number of other projects that cannot be presented here for reasons of space. Many are further phases of projects that have been in progress for several years. Certain of the important programs in the Division brought forth fewer projects than others — the Agricultural Economics program, for example. Although this program was launched relatively recently, it has managed, among other things, to fund projects on cassava technology in Paraguay and cold storage facilities for vegetables in the Philippines. In a number of other cases, the program will enable economists to evaluate the relevance of research projects currently in progress.

Each new grant made by the Agriculture, Food and Nutrition Sciences Divison is an opportunity for further reflection on how best to build scientific skills in the developing countries. Thus viewed, the Division's operations are themselves a form of research that we have tried to present here by going through the list of projects.

The Needs of Children

Of the 220000 births that take place every day, 90% are in the Third World. Although the chance of survival of these newborns has improved by 50% in the last 20 years, the first few hours, days, and months of their lives are still an obstacle course.

Parents need more information on infant nutrition to feed their babies properly.

From the time of birth, 20% of the children are underweight. That makes them vulnerable to viruses (yellow fever, measles, poliomyelitis), bacteria (tuberculosis, diarrhea, respiratory infections), and parasites (ankylostomiasis, schistosomiasis, leishmaniasis). Then comes the weaning period, when one out of four surviving children receives neither the quality nor the quantity of food needed to replace the sustenance provided by mother's milk. The result is that more and more children in developing countries reach adulthood with their health already largely impaired.

The Health Sciences Division of IDRC has to work in a context where each

defeat threatens to make one forget past successes. Their partners in the developing countries are the community and the researchers — the ones who know best about their own problems. In consultation with them, the Division's specialists find and fund the research that is most constructive.

The Ever-Successful Institute

Even before birth, every child in the industrialized countries has a file that is continuously updated by medical staff and parents. When health services create these files, they automatically identify "high risk" children and pay greater attention to them. In a country with limited resources, no such system can be set up — unless communities take matters into their own hands. NGOs, which evolve directly from the community, are effective channels for putting in place measures to improve the health of women and children.

In several Asian countries, programs run by NGOs have been the most effective. One such NGO, the Yayasan Atma Jaya (the ever-successful institute) in Jakarta, Indonesia, has received funds from the Health Sciences Division to test health risk cards for pregnant women that can be kept up-to-date by traditional therapists, midwives, or the future mothers themselves. The information recorded on these cards makes it possible to identify which pregnancies run the greatest risk of complications.

In Thailand, India, and Jamaica, scientists supported by the Division are conducting research to identify the factors most commonly associated with high-risk pregnancies and perinatal deaths. The director of the Department of Social Medicine at Chulalongkorn University, in Bangkok, is studying cases of those particularly vulnerable children whose birth weight is below normal. In effect, researchers in these countries are looking for indicators to help identify high-risk groups so that governments can spend their scarce resources where they will be most effective.

In the developed countries, infant mortality drops to an insignificant figure 1 week after birth. In the developing countries it remains high until weaning, which is a very critical stage. For economic reasons, milk is replaced with food that does not have enough protein. Infections, such as measles, whooping cough, parasitic diseases, and diarrhea, also weaken children, and a variety of taboos and prejudices about food further complicate matters. To learn more about weaning methods in Mali and West Africa, the Institut national de recherche en santé publique will undertake a study in three of that country's rural communities, thus enabling the government to determine the best measures for improving the situation.

The importance of this kind of information is also obvious in a country like Bangladesh, where the infant mortality rate from malnutrition is on the rise. One NGO, the Program for the Introduction and Adaptation of Contraceptive Technology (PIACT), will study the effectiveness and appropriateness of educational programs in teaching mothers how to feed infants. In the course of the study, PIACT will popularize the use of oral rehydration therapy. Despite its extreme simplicity — it consists of one part salt and 20 parts sugar dissolved in water — it is becoming one of the most effective ways to save infant lives in the Third World.

Communities Face Up to Schistosomiasis

Technical solutions are no substitute for the united efforts of a community to tackle its problems. In the case of schistosomiasis (which is caused by a parasitic worm in the urinary tract, the intestines, or the liver) drug therapy has only a limited effect. And molluscicides for killing the water snails that transmit the parasite often cost more than governments can afford.

Wherever the incidence of the disease has been reduced, as in China, it has been because the whole community joined in to fight it.

In Zimbabwe, the Blair Research Laboratory, operated by the Ministry of Health, has received a grant from the Health Sciences Division to study the sanitary practices of families and school children in the community of Madziwa. Poor hygiene is a key factor in the transmission of schistosomiasis, because it is the excreta of infected people that contaminate the water. Technicians on the project will collect urine and stool samples to measure the rate of infection in the community and later identify sites that harbour the vector snails.

This information will help guarantee the community's huge investment in the project: the construction of 3600 latrines and 150 wells. Nurses and health workers will play a vital role in ensuring that the whole community actively participates in the project and also understands it. Finally, the state of health of the community members will be evaluated and compared with that of a control population so that the results of the experiment can be assessed.

In neighbouring Zambia, more than half of the 12720 blind people, officially recorded in 1983, come from the Province of Luapula. The exact reasons for such a high localized incidence of blindness are not known. Three Zambian institutions are receiving support from the Health Sciences Division to measure the incidence of blindness in children aged six and under and identify the causes.

One of the suspected causes of blindness, *Chlamydia trachomatis* bacteria, will be the subject of a large-scale study involving small children in the rural regions of Egypt. The research will be conducted cooperatively by the University of Alexandria and McMaster University, in Hamilton, Canada. The project will also deal with the causes of respiratory diseases in a region where the infant mortality rate is estimated to be 20%.

African Health Specialists

The Health Sciences Division has gone to great lengths recently to increase the number of medical research projects it funds in Africa, where health needs are enormous. In four out of five countries there, the infant mortality rate exceeds 10%. Important efforts are taking place in several countries, including Togo where IDRC is funding two epidemiological studies. In one project, researchers are investigating guinea worm, a parasite that traditionally is removed from the body by rolling it very gently around a stick — an operation lasting from 1 to 4 weeks. The female worm sometimes reaches a length of 1.2 m. A second project focuses on another parasite, ankylostoma, which infests the gastrointestinal tract of small, underfed children.

Traditional Healers

As part of a new program, the Health Sciences Division has funded a number of evaluations of existing health services in developing countries. Several of these studies take into account what traditional medicine has to offer.

In Haiti, the Division has agreed to fund a comparative study of traditional and modern medicine. The concept of primary health care advocated by the World Health Organization (WHO) calls for the participation of the community. In Haiti, herbalists, acupuncturists, midwives, and *hougans* (priest–medicine men) are an extremely influential group without whose help it would be futile to attempt to mobilize the rural communities. The Centre de recherches en sciences humaines et sociales, in Port-au-Prince, which has already conducted a well-received study on internal migration with the support of IDRC, will carry out this new project.

For about 15 years, the Health Sciences Division has been funding a host

of innovative experiments aimed at establishing basic health services of the kind proposed by the WHO. Teams in several countries have designed primary health care systems whose effectiveness must now be evaluated.

The University of Malaya, in Kuala Lumpur, will receive a grant to evaluate its model for primary health care before extending it into other regions of the State of Sarawak where it was designed. Based on community dispensaries (*klinik desa*), the system makes use of mobile voluntary teams, usually married couples, who work from manuals written in the local languages.

In Costa Rica, the Instituto Costarricense de Investigación y Enseñanza en Nutrición y Salud will study the impact of the numerous primary health care programs launched in that country during the 1970s. The project will permit researchers to conduct an in-depth analysis of statistical data already collected.

Further south, in Cali, Colombia, the Centro de Investigaciones Multidisciplinarias en Desarrollo Rural (CIMDER) received a substantial grant from IDRC to design a primary health care system adapted to rural conditions in Latin America. Under the CIMDER model, local health promoters, one from each community, are equipped with field knapsacks, each containing a complete, portable dispensary. One item in the medical package is a special measuring tape, now in widespread use, which can be used to measure the size of a child's arm to indicate his or her state of nutrition. Another substantial grant from IDRC will enable CIMDER to improve its model and measure its real impact. During this later phase, CIMDER will also serve as a training centre for interns from Bolivia and Ecuador, two countries that have begun to apply the CIMDER model and benefit from it.

For the past 12 years, the University of the West Indies in Jamaica has offered a 1-year course on public health for young Caribbean doctors. The University is now conducting a survey to ensure that the training offered is still appropriate to the changing needs of the region. The Health Sciences Division is also collaborating with IDRC's Fellowships and Awards Division to finance the final phase of a program that has enabled about 30 Chinese doctors to take Master's degrees in epidemiology at Canadian universities.

Oral Rehydration Therapy

Oral rehydration therapy can make a major contribution to reducing the number of infant deaths from diarrheal diseases and malnutrition. The precise relationship between diarrhea and malnutrition, however, is not known. Does diarrhea cause malnutrition, or vice versa? What is certain is that malnutrition weakens the defence mechanisms of the digestive system against several pathogens associated with diarrhea.

With funding from the Health Sciences Division, researchers at the Hospital Infantil Universitario Lorencita Villegas de Santos, in Bogotá, Colombia, will evaluate the way in which nutritional deficiencies limit the effectiveness of antidiarrheal treatments, particularly oral rehydration therapy. In 1985, the Division also decided to continue its assistance to WHO's Diarrheal Diseases Control Program via a second 2-year phase. Participation in this very successful WHO program has enabled the Division to become fully acquainted with the present state of research in this area and to identify national institutions suitable to receive funding support.

Another way to combat diarrhea is to ensure that a community has access to potable water. A small grant made under IDRC's Energy Research Program will enable researchers at the American University of Beirut to test a simple method of purifying polluted water by simply exposing it to sunlight in small transparent plastic containers.

Meanwhile, Philippine researchers from the National Environmental Protection Council will evaluate a treatment pond for the wastewater from several large, low-income housing projects in the suburbs of Manila. What is novel about the project is that the people who live in these districts will themselves be responsible for operating the ponds. The government's contribution will be minor.

Providing Drinking Water

Among the Health Sciences Division's more successful endeavours is a series of projects, in six Asian and African countries, that has resulted in the development of a plastic handpump for water, which the Division is now promoting for commercial production. In August 1985, in Kuala Lumpur, Malaysia, an agreement was signed authorizing the University of Malaya to manufacture and market the pump under the trade name UNIMADE. In Sri Lanka and Ethiopia, the pump has been the focus of an innovative experiment: women are manufacturing, installing, and repairing the pumps.

These University of Malaya built UNIMADE handpumps are revolutionizing water supply in rural Malaysia.

The Division also continues to support research into the supply of drinking water to rural areas. Often the difficulty lies in transporting the water into households, even though the source may be only a few metres below ground or at the foot of a slope.

In Kenya, Tanzania, Zambia, and Uganda, hydraulic ram pumps, powered by water pressure, are being used to lift water to a considerable height. Unfortunately, there are only about 20 manufacturers world wide and their pumps are expensive. The Health Sciences Division will provide a small grant to help a Ugandan engineer design an inexpensive pump that can be fabricated locally.

In Indonesia, the Division will give its support to Yayasan Dian Desa (rural light institute), an NGO that will use a special credit scheme to provide two villages with 40 handpumps. Families who buy one will pay 20% down and have a year to pay off the remainder. The credit scheme is intended to persuade the villagers to take more care in maintaining the pumps.

Another NGO, the Community Development Council, in Bo, the capital of Sierra Leone's Southern Province, has already been successful in introducing latrines and improved wells in several villages. With renewed support from IDRC, this new organization, made up almost entirely of volunteers, will expand its program into 15 more villages. The project should provide an excellent opportunity to evaluate the efforts of an African community to clean up its environment. In Mali, the Ministry of Public Health and Social Affairs will receive support from the Division to evaluate the impact of national programs, begun in 1979, for installing latrines in schools and villages.

In Southeast Asia, the agro-food industry, particularly hog raising, is developing rapidly. Over 8 years, the Health Sciences Division has provided a portion of the funds that have enabled the Pig and Poultry Research and Training Institute in Singapore to develop a technique for recycling wastewater from sties, and it has become a centre of excellence in the treatment of waste from the agro-food industry and regularly takes in trainees. The Fellowships and Awards Division and the Health Sciences Division are cooperating to fund the training of 20 engineers from the countries of the region.

Education for the Majority

Families in rural areas are frequently willing to make large sacrifices to ensure that their children receive a valuable education. Often the students are sent into the towns to live with relatives or are placed in private schools even though this form of education is costly.

In sub-Saharan Africa, many of the public schools are in a deplorable state. Although the continent has largely exceeded its objectives for the number of university degrees awarded, the percentages of children who complete primary and secondary school are far below the stated goals of many governments. How long will the wish of historian Joseph Ki-Zerbo — that African universities not become "islands of future wealthy people surrounded by an ocean of obscurantism and wretchedness" — continue to be simply a wish?

Among other activities, IDRC's Social Sciences Division supports the efforts of teachers in developing countries to bring education within reach of the majority, especially of young people in rural areas.

"Mushroom" Schools

In Sierra Leone, the Centre for Research into the Education of Secondary Teachers will receive support from the Division to enable it to propose concrete and realistic reforms to the Ministry of Education. In the first stage of its research, it has already thoroughly documented the failure of secondary education in Sierra Leone, which has been marked by the growth of private institutions called "mushroom" schools. In neighbouring Liberia, a small grant will enable a researcher at the University of Liberia to prepare criteria for the evaluation of primary school principals. And in Lesotho, a small grant to two researchers at the National University will fund an inquiry into a process of improvement begun by teachers who decided to accept the challenge of providing quality instruction.

Lack of school supplies, teachers, and infrastructure are not the only things that limit the effectiveness of child education in developing countries. In many families, children have to work because the income they generate, no matter how small, is indispensable. As long as parents are unable to make up that loss, they will not be able to send their children to school. The Institute of Education and Research, of the University of Dhaka, Bangladesh, will attempt to determine the shortfall in income that prevents the poorest children from getting an education. The results of the study will be most valuable because the government seems increasingly open to the idea of schools that set classroom hours that permit children to help their families or to earn money.

Several projects funded by the Social Sciences Division have enabled Latin American specialists to determine how society might best regain control of the education of its children, now that a tide of democratization is sweeping many countries of the continent. In Argentina, the Latin American Faculty of Social Sciences (FLACSO) will conduct an in-depth study of the mechanisms needed to allow parents, particularly in underprivileged districts, to participate in school operations. In Chile, the Programa Interdisciplinario de

Investigaciones en Educación, in Santiago, will seek ways of giving the users of public schools a greater voice in their operations. The present government has neglected the public sector, whereas private schools, which are inaccessible to the poor, have flourished. Researchers in the Caribbean are also interested in this kind of research.

The Division has funded the first study on the contribution of the school system to improving the lot of Jamaica's underprivileged. The Division has also agreed to fund several evaluations of teacher training in Jamaica, Uruguay, Indonesia, Thailand, and Pakistan. In the case of Pakistan, an experimental program of supplementary training for teachers has been set up by underprivileged people living in the north of the country. This IDRC-funded project will also show to what extent the program's design can be applied elsewhere.

Traditional Learning

In one of the most innovative and original groups of projects approved by the Division, researchers are investigating the contribution made by community and traditional organizations to education. In Chile, the Centro de Documentación de Estudios en Educación (SUR) will conduct an in-depth study of the educational methods used by groups working in the most underprivileged areas. In Quito, Ecuador, the Centro Andino de Acción Popular will attempt to design new instructional methods based directly on the culture and traditional learning systems of Indian communities. The main objective of this new teaching scheme will be to transmit traditional knowledge about health, food, agriculture, and the marketing of agricultural products. Finally, in Morocco, a researcher at the Institut agronomique et vétérinaire Hassan II will carry out an in-depth study of the *msids*, the traditional Koranic schools that are flourishing again because of the general Islamic revival. This research should supply valuable suggestions for improving these schools, particularly in the rural areas, as it is becoming increasingly important to find out how such institutions can complement the training given in the state schools.

These few paragraphs can hardly do justice to the hypotheses, ideas, and innovations of researchers devoted to improving the lives of Third World children. But perhaps they are enough to demonstrate the importance of research to help the most valuable asset the developing countries have: their children.

The Needs of Local Enterprises

When it was established in 1970, IDRC had four program Divisions: Agriculture, Food and Nutrition Sciences; Health Sciences; Information Sciences; and Social Sciences. The range of the Centre's activities was enormously expanded with the inauguration in 1981 of the Cooperative Programs, which became a new program division 2 years later.

The Cooperative Programs Division funds research projects in which scientists from developing countries work with their Canadian counterparts. These are not technical-assistance projects; rather they are joint research activities distinguished by their collaborative nature and equality of partnership. In 1985–86, total funding for cooperative projects was $15 million. About half of this went to projects under the direct guidance of the Centre's other divisions. The remainder was directly managed by the Division itself.

It was under the Cooperative Programs Division that two new and important subprograms of IDRC were created: the *Earth Sciences* subprogram, which has been active for several years, and the recently launched *Technology for Local Enterprises* subprogram. The latter is designed mainly to serve small- and medium-sized industrial enterprises. Apart from the requirements that each

project be appropriate to the country involved, and that the research team in the recipient country play the leading role, one of the essential criteria is the availability of well-developed Canadian scientific expertise in the project discipline.

In Canada there is, for example, what has been referred to as the "Chalmers' solidification school," named after an eminent Canadian metallurgist. Several of his former students now teach in Canadian universities and abroad. The Cooperative Programs Division will enable some of them, from the Laboratorio de Entrenamiento Multidisciplinario para la Investigación Tecnológica, in La Plata, Argentina, and from the University of British Columbia, in Vancouver, to work together. They will bring to Argentinian foundries the technology for manufacturing graphite cast iron in cupola smelting furnaces. Compact graphite cast iron is in great demand, and mastering the technique would open up a large market to small- and medium-sized Argentinian foundries.

In Venezuela, it is the aluminum smelting industry that will benefit from joint research at the Central University of Caracas and Queen's University in Kingston, Ontario. Researchers at these institutions will be investigating the effect of iron in aluminum–silicon alloy casting. The project will facilitate joint research on techniques to diminish the harmful effect of iron, which makes such castings brittle. The Cooperative Programs Division has approved three other projects in Argentina. The first links the University of Mar del Plata and the University of Alberta to create welding consumables for chromium molybdenum steels. The main product will be flux-cored welding consumables using metallic salts to protect electrodes from oxidization.

Inexpensive Construction Materials

The two other Argentinian projects are part of a series of investigations into inexpensive construction materials for housing projects. Given the expected increase of 1.5 billion in the world population by the year 2000, 50000 dwellings per day will have to be built globally for the next 15 years. Most of the population increase will occur in the developing countries where people cannot afford the cost of regular construction techniques and materials — particularly cement, the price of which has tripled in the last 5 years. Many Third World scientists are, therefore, looking for a substitute for cement or at least a partial replacement for it. In cooperation with two Argentinian groups, the Canada Centre for Mineral and Energy Technology (CANMET) will try to incorporate two kinds of industrial by-products into Portland cement, which is relatively expensive. One material is fly-ash, a by-product of coal-powered generating stations; the other is blast furnace slag, produced by steel mills.

In Brazil, the Institute for Technological Research, of São Paulo, will collaborate with scientists from the University of British Columbia in an attempt to maximize the amounts of rice husk ash and blast furnace slag that can be added to cements used in low-cost housing. Brazil produces 400000 t of rice husk ash and 3 million t of blast furnace slag per year.

Mastery of Composite Materials

In 20 years, Mexico has increased its automobile production by 700% to almost 2 million assembled vehicles a year. The assembly plants belong to large multinationals, but half of the 850 manufacturers of auto parts are owned by Mexican interests. Because automobile technology advances rapidly, the Mexican parts manufacturers are in danger of losing some of their markets. The Cooperative Programs Division has agreed, therefore, to fund joint research by the Autonomous Metropolitan University of Mexico and a Canadian firm,

Metallurgical Consulting Services, of Saskatoon, into the manufacture of leaf springs using composite materials. Such "plastic" springs would weigh only one-fifth as much as regular springs, making for lighter and, therefore, more fuel-efficient cars.

Making Commercial Use of Coal

Another Latin American country, Colombia, annually imports $20 million worth of activated carbon, which is used, among other things, for water purification. A large sum in foreign currency could be saved if it were possible for small- and medium-sized firms to manufacture this product from coal dust as a result of a joint project of the Universidad Nacional de Colombia and the Royal Military College of Kingston, Canada. In another project, researchers at the University of Sherbrooke, Quebec, and CANMET have already patented a process to make low-grade coals, such as lignite, marketable. Lignite is made to react with carbon monoxide and water, which transforms it into a smelting coal, coke. The patent is not very significant for Canada, which has large reserves of coking coal, but it will enable Turkish steel mills to reduce their production costs by 15–20%. The University of Cukurova in Adana, Turkey, will be the local partner.

In India, the boiler manufacturing industry will be the beneficiary of a contribution by specialists at the Technical University of Nova Scotia. The Canadians are working on a circulating fluidized bed boiler that uses low-grade, high-ash coal. If the project succeeds, India will gain hundreds of millions of

We must build 50000 housing units a day — mostly in the Third World — to shelter the world's burgeoning population.

tonnes of additional coal reserves now regarded as useless.

The diversity of IDRC's cooperative activities is further illustrated by the range of topics covered in a number of other research projects now being funded: computer-assisted design of furnishings for low-cost housing (Hong Kong), the manufacture of instruments of measurement (Singapore), and the use of gaseous mixtures in high-voltage circuit breakers (China). Lastly, the Cooperative Programs Division is funding IDRC's first cooperative project in the field of law. This will be a comparative study of legal aid clinics in Colombia and Canada, to be administered by legal specialists in IDRC's Office of the Secretary and General Counsel.

Despite the wide range of projects, they all have one element in common: their purpose is not so much to transfer technology but to make a scientific contribution to create new knowledge. All of the partners are researchers not salesmen on one side and customers on the other.

Solid Foundations

During 1985, the Cooperative Programs Division continued to fund earth sciences research.

The University of Sherbrooke will have the opportunity to work with the École Mohammedia d'ingénieurs, of Morocco, to study the "swelling clays" on which many neighbourhoods of Morocco's coastal cities are built. These clays can cause the collapse of one- and two-storey houses by expanding whenever they absorb water.

The same Canadian university will also collaborate with the École nationale d'ingénieurs de Sfax, in Tunisia, in the accurate mapping of wadis (riverbeds that are normally dry but can suddenly flood when torrential rains fall). Many houses in Tunisia's second largest city have been built on such watercourses. A map of the areas subject to this infrequent but often devastating flooding will make it possible to formulate realistic preventive measures.

The Earth Sciences subprogram is largely concerned with hydrogeological research. This kind of work is extremely valuable because of the growing importance of groundwater and because there is, as yet, no clear understanding of how to utilize it rationally. In Bangkok, a study is being made of land subsidence because of the overuse of the groundwater under the city. Bangkok is only 1.5 m above sea level and is sinking 5–10 cm/year. Joint research by the Asian Institute of Technology and McGill University aims to design preventive measures with a view to developing the land to the south and north of Bangkok. Elsewhere, the National Directorate of Mines and Geology of Uruguay and the Université nationale du Bénin will be partners with the University of Québec in Montreal in a study of the rational use of underground aquifers. In both countries, this water is in danger of being depleted, which could eventually lead to contamination by salt water.

The Floating City

The enormous metropolis of Mexico City is built on a dry lake bed beneath which are two aquifers, each from 3 to 5 m thick, separated by 40 m of alluvial soil. Some 300 million m^3 of water are drained annually, resulting in frequent land subsidence that, in turn, causes cracks in buildings and the rupture of water pipes. The Universidad Nacional Autónoma of Mexico and the University of Waterloo in Canada are collaborating on the development of a computerized model of the aquifers that will provide critical information on the future of the Mexican capital, soon to become the largest city in the world.

On 19 September 1985, one of the most violent earthquakes in history struck Mexico City, killing many thousands of people. Apparently, the peculiar nature of the subsoil caused an amplification of the seismic waves, resulting in the collapse

The many IDRC-supported studies help policymakers to make informed decisions.

of many large buildings. In the poorer districts, the adobe houses (made of dried mud and straw) also collapsed. This type of traditional structure is extremely vulnerable to earthquakes and was partially responsible for thousands of deaths in Peru in 1970, in Nicaragua in 1972, and in Guatemala in 1976. Numerous programs have been undertaken to promote the use of other construction materials, but they have had little success. Now, researchers at the Pontificia Universidad Católica del Perú and Concordia University, Montreal, are trying a new approach. The aim of their project is not to replace adobe, but to reinforce it, so that this inexpensive material can be used to build safer houses.

The Desire for Joint Research

When the Cooperative Programs were instituted, many people feared that IDRC would become less attentive to requests from the Third World. Indeed, in the beginning, the majority of requests for cooperative research funds came directly from Canadian institutions, although the projects that were eventually approved all had developing-country institutions participating in the final design and execution of the research. Now, after 4–5 years of activities, the administrators of the Cooperative Programs are pleased that the proportion of requests directly from Third World institutions, alone or in association with a Canadian institution, has been rising. In 1981–82, the figure was only 34%; in 1982–83, it reached 67%; and in 1983–84, 80%. This clearly shows that Asian, African, and Latin American scientists are increasingly aware of the opportunities afforded by the program. In fact, even those IDRC staff who had doubted the usefulness of cooperative research now admit that Third World specialists seem keen to work with their Canadian counterparts. Despite this,

the major portion of Centre funds continues to be allocated to projects for which success rests entirely on the shoulders of developing-country researchers.

The Needs of Decision-Makers

The results of IDRC-funded projects are usually aimed at the people who guide the future of their countries: the decision-makers. In the case of an improved variety of cassava, for example, the Ministry of Rural Development may have to decide whether or not to promote it. Or, if it is a new design of latrine, then the Ministry of Health may have to make the decision to release the funds needed to disseminate the technology.

This last chapter examines the role of research in the social and information sciences. Most work of this kind produces data and documents that cannot be used directly by the general public. The products of such research find application only when placed in the hands of those close to the centres of decision-making.

The political heads of developing countries are constantly inundated with advice, recommendations, and even outright demands that they follow a certain course of development action. These "inputs" very often have one thing in common: they all come from outside the country. As one African intellectual put it: "The relative inertia of governments and people alike can be explained by the lack of consensus that results from there not being any genuine internal debate about the measures to be taken."

If such debates are ever to occur, they will require a host of demographic, environmental, and economic data, as well as information about the impact of previous policies. For example, in India, which has been a veritable laboratory for testing development policies for the past 25 years, the extensive data that have been accumulated now make it possible to understand better the reasons for the country's successes and failures.

If one had to provide a single raison-d'être for IDRC's Social Sciences and Information Sciences divisions, it would be that they provide the necessary foundation for genuine internal debate in developing countries. Decisions taken in the wake of these debates between citizens, political leaders, and indigenous specialists are much more likely to be realistic and capable of execution.

Many of the Social Sciences Division's projects are financially modest, but all of them serve to provide more experience and self-confidence to the future experts of the developing countries. In some cases, the projects involve isolated individuals; in others, the Division makes a concentrated effort and joins other donors in setting up what amounts to a full-scale "think tank." In almost all cases, the Social Sciences Division encourages university faculty, officials, and decision-makers in the countries concerned to work together to maximize the chances of the results being used.

Helping Small-Scale Farmers

Agriculture is central to the most recent development theories. Once the production and income of farmers begins to increase, according to theory, a host of small rural industries springs up based on agricultural activities. Subsequently, this rural industrialization facilitates the birth and development of heavy industry in the cities.

A grant from the Social Sciences Division to the Centre d'études, de documentation et de recherches économique et sociale, in Burkina Faso, will enable researchers there to assess the growth potential of industries that process three agricultural products: peanuts, hides, and shea butter (a vegetable oil extracted from the shea tree). Researchers in the Department of Political Science at the University of Ghana, in Legon, will investigate contracts by which farmers sell their produce to

large companies that supply seeds, fertilizer, and technical assistance. Several important financial institutions are planning to invest in this contractual form of agriculture to stimulate the production of palm oil. First, though, it would be wise to determine the extent to which such contracts really benefit the farmers. Along the same lines, an economist at the University of the Philippines at Los Baños will investigate how risks are shared in contracts between small planters and transnational companies that export bananas and pineapples.

In the same area of research, a team from Al-Najah University on the West Bank will study six agroindustries to determine whether they have sufficient potential to attract local young people who, at present, are leaving the countryside to work in Israeli cities.

Another study, at Peradeniya University, in Sri Lanka, clearly demonstrates the importance of the economic research supported by the Social Sciences Division. The Government of Sri Lanka is currently preparing to promote milk consumption. According to the agricultural economist leading the study, however, such programs are not effective because, he argues, the demand for milk is not elastic. Here again only context-specific research can show whether his hypothesis is correct. Whatever conclusion is reached, the decision-makers will be quickly informed of it because the chief planner in the Ministry for the Development of Rural Industry is a member of the research team. In addition, the researchers will surely be anxious to exchange ideas with their colleagues at the Marga Institute in the capital, Colombo, who will be undertaking an input–output study to determine whether 12 villages, each in a different region, gain or lose in their overall economic activity.

Economics and Ecology

Some of the research funded by the Social Sciences Division touches on issues on which it is impossible to avoid argument. Agrarian reform, for example, is central to political life in the Philippines and is a subject on which the government has recently issued important decrees. Two studies, one by the University of the Philippines at Los Baños and the other by the Visayas State College of Agriculture (VISCA) Educational Foundation, will help to provide a better understanding of the economic situation of communities in areas of forest exploitation, particularly on lands recently distributed by the government on the island of Leyte. The researchers are trying to determine how it might be possible to ensure these communities a stable income and, at the same time, protect the environment. The population under study occupies marginal and fragile lands, often on mountainsides. They have, so far, eked out a living from them, but at the price of irreversible soil erosion and forest destruction. Most of the technical means for preventing environmental deterioration do exist, but a whole complex of socioeconomic conditions must be met if they are to be of any use. These studies will provide information on these necessary conditions, which relate to systems of land tenure, prices, grants, and regulations.

The Agriculture, Food and Nutrition Sciences Division and the Communications Division have linked up with the Social Sciences Division to help the Centre ivoirien de recherches économiques et sociales (CIRES) in Abidjan to develop as a centre of excellence in economic research for West Africa. CIRES will specialize in agricultural economics and seek out development models in which agriculture is instrumental.

The relatively modest contribution of the Communications Division to this project will be in the form of a grant to CIRES' quarterly publication. The editors of *Cahiers du CIRES* will also have an opportunity to improve their training in scientific and technical publishing at

two workshops organized by the Université d'Abidjan and supported by the Communications Division. This activity will enable 15 editors working on scholarly publications in French-speaking Africa to become familiar with the most recent technology in the rapidly changing world of publishing. The content of the workshops was established at a meeting of the trainees in Dakar in February 1985.

In Southeast Asia, the Agriculture, Food and Nutrition Sciences Division will join with the Social Sciences Division in supporting a series of socioeconomic projects on fisheries and artisanal aquaculture. The work will be conducted by researchers at six institutions in Indonesia, Malaysia, the Philippines, and Thailand. The International Centre for Living Aquatic Resources Management (ICLARM) will coordinate the numerous studies to be undertaken. This project, by itself, should result in the training of dozens of specialists who will provide Southeast Asia with a "critical mass" of researchers in the field of aquatic resources economics.

The Newly Industrialized Countries

The 1960s and 1970s saw the rise of the so-called "newly industrialized countries," which usually include Brazil, South Korea, Hong Kong, Mexico, Singapore, and Taiwan. Their success upset so many pessimistic forecasts that they have been referred to as the "official miracle countries."

On the face of it, it seems improbable that a second generation of newly industrialized countries will soon appear. A number of factors united to favour the emergence of the first group. Industrial development in those countries coincided with rapid expansion of the world economy. Moreover, billions of petrodollars were recycled through banks that in turn made loans to Third World economies. Nowadays, the expectation is that there will be a decline in the growth rate of the world economy. The banks are more cautious about making loans, and any second generation of newly industrialized countries will have to face competition from the first.

But for countries such as Colombia, Peru, Malaysia, Thailand, and Zimbabwe, which are aspiring to the title "newly industrialized," the future may not be quite so bleak as it now appears. In certain sharply defined industrial sectors, these countries are very competitive and they may be able to develop their economies by getting a toehold on specific commercial activities. Moreover, new forms of financing, such as joint ventures and guaranteed investments and loans, are being considered as ways to get capital flowing to poor countries again. Researchers from these five countries competing in the development race will examine these hypotheses in a project funded by IDRC and administered by the Overseas Development Institute (ODI) of London, England.

Meanwhile, specialists from the Indian Council for Research on International Economic Relations in New Delhi will have support from the Social Sciences Division for two important projects. The first involves planning a study on the industrial restructuring of India. The execution of the study itself may also subsequently receive funding. The second and parallel project consists of six sectoral studies on India's manufacturing industry. India stood up well to the oil industry shocks, first because of good budgetary measures, second by discovering and exploiting its own oil reserves, and lastly because of money sent home by Indian citizens working abroad. Nonetheless, the trade deficit is growing rapidly, and India's success may well be endangered if the country does not increase its exports. It is, in fact, surprising that a country with such large numbers of trained labour, experienced engineers, and administrators and skillful entrepreneurs does not play more of a role in the world trade of

The economic crisis of recent years brought a number of Latin American projects to an abrupt stop.

manufactured goods. It would seem that import substitution policies and measures to protect local manufacturers have favoured the development of a large number of industries but that they are not dynamic enough to tackle international markets. These studies will attempt to explain why Indian producers of diesel engines, pharmaceuticals, bicycles, motorcycles, air conditioners, and detergents are not more aggressive outside the country.

Coping with Protectionism

The first generation of newly industrialized countries cannot afford to rest on its laurels. Thus, Singapore has to rethink its economic strategy and drop those industries that need a large labour force, in favour of advanced industries that employ highly trained personnel. The industrial reconversion of this Southeast Asian city-state is of great interest to many neighbouring countries that will try to pick up the industries Singapore drops — thus the timeliness of the IDRC funding of the Institute of Southeast Asian Studies (ISEAS) to investigate the new industrial pattern that is emerging.

Another important project, a study of the constraints imposed upon the newly industrialized countries by protectionism, will be conducted by ISEAS in collaboration with the North–South Institute, Ottawa, Canada, as a cooperative project. And at Yonsei University, in Seoul, researchers will study the potential for countering protectionism by promoting exchanges of the same kinds of manufactured goods. Japan, for example, would sell cars to South Korea as well as buy them there. The significance of this kind of trade between industrialized countries suggests that it might be less susceptible to protectionist measures.

It sometimes happens that the process of industrialization in a country slows down, falters, and even regresses. Under the military government that ruled Argentina from 1976 to 1983, the informatics sector declined sharply. Foreign firms increased their share of the market from 30 to 80%, and employment in Argentinian electronic equipment firms collapsed from 13 000 to 4400. What is even more worrying for the future is that local firms practically abandoned research. Consequently, the Social Sciences Division is making a sizable contribution to a major study by the Asociación Argentina para el Desarrollo Tecnológico, which will provide the new government with recommendations on how to put the informatics sector back on track. The Division has also provided modest support to a researcher at the Latin-American Institute for Transnational Studies (ILET) in Buenos Aires to survey the literature on computerization in Latin America.

Again in Argentina, the former regime radically liberalized the money

markets. This resulted in the complete redistribution of wealth, shook the financial system to its core, and created a parallel economy that accounts for up to 30% of the GNP. One economist, who had previously received support from the Social Sciences Division, is now the principal economic advisor to the Argentinian government. The Division will continue to support his research team's work, the results of which are essential to the reform of the financial system. Meanwhile, the Division will also help Latin American specialists in Brazil, Chile, Colombia, and Peru to exchange results with their Argentinian colleagues. Those at the Universidad del Pacífico, in Lima, Peru, will receive two IDRC grants to develop an economic model of their country. During the last 30 years, Peru has tried out several models of industrial development, from the introduction of measures to stimulate exports, to the promotion of import substitution, to the neoliberalism of the last 5 years. Nonetheless, the country is now confronted with galloping inflation, coupled with a drop in production and in the real income of workers. If the researchers in Lima succeed in simulating the Peruvian economy on a computer, they will certainly attract the attention of the new government.

Readymade Solutions

Despite the host of problems Latin America faces, it is at least blessed with a wealth of economic specialists. In East Africa, however, experienced economists are much rarer. The Social Sciences Division hopes to promote the development of greater economic expertise in the region by supporting a series of individual studies, seminars, and publications. In the long run, future African specialists will ensure that more reliable economic data are collected. In so doing, they will make it possible for the governments of the region to be more active in dealing with the numerous solutions suggested by foreigners.

The Division has also agreed to support two series of investigations designed to strengthen expertise in the area of science and technology policy in six African countries. The first series will enable researchers in Algeria, Ivory Coast, and Sénégal to study the potential contribution that the introduction of sugar refineries would make toward the development of their national technological capability. In the second series, researchers in Ghana, Nigeria, and Sierra Leone will receive grants to execute a number of case studies and share their experience at several workshops spread over 2.5 years.

In the area of energy, the Social Sciences Division, drawing on an IDRC fund designated for "Special Program Activities," will finance a network of researchers in Argentina, China, Costa Rica, and the Philippines. These four national teams will survey the various technologies used to produce energy in the rural areas of their respective countries. When the results have been collated and compared, the researchers hope to have an accurate picture of the types of energy sources best suited to rural situations. A separate study will enable the Tata Energy Research Institute (TERI), in New Delhi, to undertake a similar project in India.

Female Migrant Workers

Over the years, the Social Sciences Division has funded numerous investigations into a variety of demography-related issues, such as fertility, access to the labour market, and migration. Recently, the Division supported a series of studies on the condition of women in rural regions. In Nicaragua, three researchers at the Centro de Estudios del Trabajo will try to learn more about the numbers and conditions of migrant women labourers employed in coffee- and cotton-growing areas. In Sri Lanka, the Centre for Women's Research will study the causes and consequences of migration by women looking for work. And in

Nigeria, a geographer at the University of Ibadan will study the socioeconomic consequences of large numbers of women leaving their villages in two areas of the State of Kwara. In all of these studies, the researchers will collect information on how these women reconcile the demands of their work with those of their traditional family roles.

At the moment, Africa has the highest rates of fertility. Kenya, for example, is experiencing a population growth of 4% per year, the highest in the world. Increasingly, the Kenyan government is openly supportive of the activities of NGOs, such as the National Council of the Churches of Kenya, which, since the 1970s, has been advocating birth spacing. In view of the growing interest in its activities, the Council will undertake a detailed study of the impact of its programs that have trained 1800 family planning teachers. In its efforts to encourage the training of demographers, the Social Sciences Division has joined IDRC's Fellowships and Awards Division in providing support to the Council for the Development of Economic and Social Research in Africa (CODESRIA) in Dakar, Sénégal. CODESRIA will set up a program to fund some 30 small-scale studies over a 4-year period. The grants will go primarily to promising young African researchers.

People Uprooted by Drought

Alongside urbanization and the birthrate there are several other factors affecting the distribution of people in Africa. The droughts of the last 15 years, for example, have resulted in the appearance of numerous refugee camps and have forced nomadic populations to become sedentary, that is, to settle. In Mali, the nomadic Tuaregs make up only 7% of the population, but they own 40% of the livestock. The deterioration of climatic conditions has completely upset their traditional way of life. A study undertaken by the Office malien du bétail et de la viande will make it possible to learn more about the patterns of nomad "sedentarization" in three areas of Mali. This will be the first study in an IDRC-supported network of research projects that will examine how the people of the Sahel are adapting to ecological change.

In the Caribbean, there is already a migration research network that links researchers at the campuses of the University of the West Indies in Barbados, Trinidad, and Jamaica. In one project supported by the Social Sciences Division, researchers are studying the migration of workers from the Caribbean to Canada. In fact, Toronto, Canada's largest city, is one of the two main destinations of emigrants leaving the Caribbean. The other is New York City. The purpose of the project is to provide an assessment of the migration issue that is sufficiently comprehensive to enable policymakers to predict future migration trends.

Storing Precious Data

Management experts insist that businesses should attach great importance to communications if they wish to achieve excellence. They cite the case of a large U.S. firm that was so convinced of the importance of communication between employees that it had the layout of its head office designed in a way that would increase the opportunities for meetings and exchanges between staff members.

The Information Sciences Division of IDRC cannot remake the world. But it can make its resources available to those who want to help scientists and decision-makers obtain the information they need. Its support has made it possible to set up specialized documentation centres, libraries, and databases. The Division also supports a variety of experiments that are integral to the new global pattern of communications now emerging. Its main concern is to ensure that Third World specialists play a role in this new set of interconnections that is turning our planet into a "global village."

For some years, the Division has devoted a substantial part of its funds to promoting an international network of development information, DEVSIS. The only condition of membership in the network is that the prospective participant be engaged in the collecting of national documents. Each member makes the documents of its country available to the others. DEVSIS is an example of several international cooperative networks, the best known being AGRIS, an international information system on agriculture, run by the Food and Agriculture Organization (FAO) in Rome.

A sizable contribution will be made by the Information Sciences Division to the Marga Institute, in Colombo, Sri Lanka, to enable it to set up the nucleus of a DEVSIS network for Southeast Asia, DEVINSA, which will serve four other institutions in Bangladesh, India, Pakistan, and Nepal. The institutions in these countries will themselves function as network nodes serving some 60 institutions in the five countries. After a start-up period of a few months, DEVINSA should be ready to produce monthly printouts listing the documents stored at each participating institution. These documents will cover socioeconomic issues useful to planners, administrators, scientists, and policymakers in the countries of Southeast Asia.

In Venezuela, a regional institution, the Latin American Centre for Development Administration (CLAD), will also be able to establish itself as the nucleus of a Latin American information network on public administration with a grant from IDRC. Currently, 19 countries in Latin America and the Caribbean are members of CLAD.

In Guinea (Conakry), the second part of a grant from the Division will enable the country to continue collecting documents to set up the Centre national de documentation et d'information pour le développement, Guinea's first national documentation centre. It will eventually link up with the DEVSIS international network, but its first priority will be to serve Guinean officials who, for years, have not had access to documents containing practical information.

Several of the Division's projects are designed to reinforce national structures. In the Northeast of Brazil, most of whose 35 million people live below the poverty line, the Centro Josué de Castro, in Recife, will set up a documentation centre specializing in information on the region's problems. In Sénégal, a grant will enable the Ministry of Health to restart its documentation centre. Likewise, research institutions in Mexico and Brazil will recieve support from the Division to set up documentation centres specializing in women's issues and demography. These last two countries will then be able to join the Latin American Population Documentation System (DOCPAL), which will enable them to serve their own demographers better. The Division has also agreed to fund the publication of a biomedical research bulletin published by the Ministry of Health of Burma, as well as the Thai version of a bulletin produced by Chiang Mai University for the use of medical technicians.

Putting Micros to Work

Several networks mentioned — DEVINSA, for example — are designed around minicomputers equipped with high-capacity hard disc drives. Under a new program dealing with information tools and methods, the Division will support research by the Latin American Demographic Centre (CELADE) in Santiago, Chile, into the use of microcomputers to process blocks of data from national censuses.

Only large computers, which are expensive to operate, have had the processing capacity needed to handle the masses of data that a census produces. But it is so expensive to process such data in this way that planners often quite

simply give up any hope of using these excellent sources of information. CELADE now hopes to test a method by which the information is broken down into subgroups and then stored in microcomputers. Such a breakdown — into regions, urban groupings, or city districts, for example — used to be possible only on a large computer. The subgroups, however, would be available on hard disc-equipped microcomputers. (Some hard discs have a storage capacity of 50 megabytes, the equivalent of 20000 typed pages.)

A regional breakdown of data would be extremely useful if, for example, the Ministry of Health were planning to build a clinic in a given district. The decision-makers would have all the needed data available to them on a simple microcomputer: numbers of adults and children, age pyramid, etc. There is no doubt that this would make it much easier for the ministry officials to get the answers to such questions.

Some Latin American NGOs are also planning to computerize and install telecommunications. In Chile, the Latin-American Institute for Transnational Studies (ILET) has set up the Network for Informatics Resources, in cooperation with 16 other NGOs. The Information Sciences Division will give them the necessary support to enable the various members' microcomputers to communicate with each other and, eventually, with similar organizations in Brazil, Peru, and Central America.

Teleconferencing

The United Nations University, Tokyo, Japan, will be the beneficiary of a

If research information is collected and managed properly, we can prevent duplication of scientific effort.

grant to evaluate the usefulness of a teleconferencing network for the exchange of information between specialists in brucellosis, a cattle disease. In the network prototype being planned, computers will store messages so that they are accessible at any hour of the day or night to the other participants. Such "asynchronous" conversations hold out great promise as a means of dialogue between researchers. In fact, previous experiments supported by the Division showed that such teleconferencing allows Third World researchers to deal with their colleagues in the industrialized countries on an equal footing. Eventually, these networks could breathe a new dynamism into the work of developing-country scientists who often work in isolation, cut off from sources of information.

The Information Sciences Division has also begun to support software research. One package, designed by the Commonwealth Secretariat with the help of a grant from IDRC, has attracted a great deal of attention from policymakers because it makes it possible to obtain a complete profile of a country's debts. Until now, developing countries had to manage the various components of the national debt manually, or refer back to the lending banks themselves, which until very recently were the only places where the necessary software could be found. A project approved by the Division will enable the External Resources Department of Sri Lanka to try out the software in the management and analysis of its foreign debt.

Specialized Information

In the agricultural sector, the Information Sciences Division supports numerous efforts to disseminate scientific and technical information. Some of the projects were inspired by experiments that were successful elsewhere. For example, grants have been approved for the establishment of specialized documentation centres: on potatoes, at the International Potato Center (CIP) (Peru); on coconuts, at the Coconut Research Institute (CRI) (Sri Lanka); on mangroves, at the Natural Resources Management Centre (Philippines); on weeds, at the Southeast Asian Regional Centre for Tropical Biology (Indonesia); and on postharvest techniques, at the Centre ivoirien de recherches technologiques (Ivory Coast).

In some cases, research leaves the beaten track. These are usually highly original experiments with invaluable potential. The Division has just approved a request from SACCAR, in Botswana, to set up an information centre to serve the countries of the SADCC. The Conference was established to foster economic cooperation among its members and in response to the drought that has seriously affected Southern Africa. The members are Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe. In another original experiment, in Nepal, support is being given to Agricultural Projects Services Centre (APROSC) in Kathmandu, to produce a lexicon of plants and animals in Nepali, the official language. At the moment, there is much confusion because of the large number of local dialects. This glossary will be an invaluable tool for communication between the local populations, extension workers, and scientists.

The Royal Nepal Academy of Science and Technology (RONAST) has support from the Communications Division in launching an experimental program of science popularization for the radio and print media in Nepal. Twenty radio journalists and 20 print journalists will be trained under this project, which represents the first real penetration of the Nepali media by locally produced information on science and technology.

Letting the Taxpayers Know

When the People's Republic of

China decided to catch up on the technological lag that resulted from the Cultural Revolution, it gave priority to scientific research. Not only were researchers sent back to their laboratories and the resources available to them increased, but efforts were made to reintroduce science and technology into the country's culture. The Chinese government also decided to make the popularization of science a priority. Numerous publications were launched and even Chinese translations of popular foreign publications on science were enthusiastically welcomed.

Even if their contexts differ sharply, many developing countries would like to ensure that scientific and technological information is not the exclusive property of a small minority. IDRC's Communications Division has modest funds at its disposal to respond to the requests of countries that wish to experiment with popularizing national and international scientific research.

In Peru, the Grupo de Estudios para el Desarrollo has received a grant from the Division to train Peruvian journalists in the better dissemination of scientific and technological information relevant to the country's development. These professionals may eventually collaborate in the new Spanish-language science news service that the Agencia Latinoamericana de Servicios Especiales de Información has just started with a grant from IDRC. Across the Pacific, the Philippines News Agency has been able to re-start its science news reporting service thanks to a training workshop for 20 journalists funded by the Communications Division. Elsewhere in Asia, the Division has already contributed to the organization of two workshops in science programing for television professionals by the Asia–Pacific Institute for Broadcasting Development (AIBD), one in Kuala Lumpur, Malaysia, and the other in Colombo, Sri Lanka.

In Africa, a training workshop for 20 educators from schools of journalism and communications in the nine member countries of the SADCC could have a significant multiplier effect in promoting science journalism in the region.

One project that can serve very well as a final note on which to conclude this description of the activities of IDRC is the grant given by the Information Sciences Division to the African Intellectual Property Organization (OAPI) at Yaoundé, Cameroon. IDRC's contribution will be used to build up the Patent Documentation and Information Department, and its regional branches. By becoming more efficient and making its information more readily accessible and of higher quality, OAPI will greatly increase the credibility of patents registered in Africa. Over time, this service will help to bolster the creative activity required to fulfill Africa's technological needs.

The central theme of this publication can be stated in a single sentence. Indigenous scientific and technological creativity that produces relevant research results must be fostered in the developing countries to ensure that the needs of their people are truly met. IDRC is only one of many agents in an enterprise unique in the history of mankind — the effort to exchange not only goods or even knowledge but to share the mechanisms and methods by which new knowledge is generated. To achieve this, IDRC makes use of all possible channels, whether they be international, regional, or national institutions.

Books

IDRC annual report 1984–1985/Rapport annuel CRDI 1984-1985. 96 + 90 pp. IDRC-003/85e,f

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Irrigated forestry in arid and semi-arid lands: a synthesis. F.B. Armitage. 160 pp. IDRC-234e

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Pasture improvement research in Eastern and Southern Africa: proceedings of a workshop held in Harare, Zimbabwe, 17–21 September 1984. J.A. Kategile, editor. 508 pp. IDRC-237e

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Laboratory and field testing of handpumps. Goh Sing Yau. 138 pp. IDRC-TS51e

Recommended methods for development-information systems, Volume 2: Guidelines for the building of authority files in development-information systems. A. Di Lauro and M. Sly. 204 pp. IDRC-TS52e

Magazines

The IDRC Reports/Le CRDI Explore/El CIID Informa are quarterly magazines that present IDRC's activities in the form of articles dealing with the fields in which IDRC is active. They are published in French, English, and Spanish. The total circulation is 24 000 and is distributed free to decision-makers and researchers in the Third World, Canada, and the industrialized countries.

Films

Trees of Hope

In some African countries, 90% of all energy requirements comes from firewood. Unfortunately, consumption for human needs outstrips natural regeneration, and hungry animals attack the remaining vegetation. When the rains fail, the desert advances.

The IDRC film *Trees of Hope* documents this rapid deforestation and analyzes various solutions such as shifting to solar energy and improving traditional stoves. It emphasizes the importance of reforestation using the example of a village woodlot project in Niger where foresters have exchanged their traditional role of wardens for that of rural-development workers. The 18-minute film, produced by IDRC's Communications Division, was shot on location in Niger, Mali, Sénégal, and Nigeria.

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